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Analysis of Antioxidant and Fiber Content in Edamame Pudding (Glycine max) as a Snack to Prevent Hypercholesterolemia

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ABSTRACT

This research explores the antioxidant and fiber content of edamame pudding (Glycine max) and its potential health benefits, particularly in preventing hypercholesterolemia. Edamame, a rich source of antioxidants such as isoflavones and phenolic compounds, is known for its ability to combat oxidative stress and reduce cardiovascular risk. Additionally, its high fiber content, particularly soluble fiber, plays a significant role in lowering LDL cholesterol levels. This study analyzes the antioxidant levels and fiber content in edamame pudding and evaluates its potential to serve as a health-promoting snack. The findings highlight the pudding's role in cholesterol management, heart disease prevention, and weight control. Edamame pudding offers a practical and nutritious alternative to traditional snacks, with the potential to support cardiovascular health. Recommendations for further research include long-term clinical trials to assess the sustained effects of edamame pudding on heart health and studies comparing its nutrient bioavailability to other health-promoting snacks.

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1. INTRODUCTION

Hypercholesterolemia, characterized by elevated cholesterol levels in the blood, is a significant risk factor for cardiovascular diseases, which are among the leading causes of morbidity and mortality worldwide(Wadhera et al., 2016). The condition is closely associated with an increased risk of atherosclerosis, heart attacks, and stroke. While pharmacological treatments exist, dietary modifications remain a cornerstone in managing and preventing hypercholesterolemia. Among the various dietary approaches, incorporating foods rich in antioxidants and fiber has been shown to help reduce cholesterol levels and improve overall heart health(Viuda-Martos et al., 2010).

Edamame (Glycine max), a young, green soybean, is widely recognized for its high nutritional value and health benefits(Djanta et al., 2020). It is rich in protein, vitamins, minerals, and dietary fiber, making it a popular food in various cuisines, particularly in East Asia. The consumption of edamame has been associated with a range of health benefits, including improved cardiovascular health, due to its high content of isoflavones and antioxidants, which help combat oxidative stress(Zaheer & Humayoun Akhtar, 2017). Additionally, edamame's high fiber content, particularly soluble fiber, plays

a key role in lowering cholesterol levels by binding to bile acids and facilitating their excretion, thus reducing cholesterol absorption in the intestines.

Edamame is traditionally consumed in its whole form, often as a snack or side dish, but its versatility as an ingredient allows for a wide range of culinary applications(Shurtleff & Aoyagi, 2001). One such application is in the development of edamame pudding, a plant-based dessert that retains the nutritional benefits of edamame while offering a delicious and convenient snack option(Golbitz & Jordan, 2006). The pudding form of edamame may provide an attractive alternative to conventional high-calorie, low-nutrient snacks, making it a potential functional food to help combat hypercholesterolemia(Kresser, 2013).

Here is a review of previous research on edamame and its health benefits, particularly focusing on cholesterol management. The Role of Soybeans in Lowering Cholesterol Levels (Wang, H., & Zhang, J., 2015). This study investigated the cholesterol-lowering properties of soybeans, including edamame. The authors found that consuming soy-based foods, rich in isoflavones and fiber, led to a significant reduction in LDL (bad cholesterol) levels. The study concluded that the inclusion of soy products, including edamame, could be beneficial in managing hypercholesterolemia and improving cardiovascular health.

Dietary Fiber and Cholesterol Reduction (Anderson, J. W., & Bridges, S. R., 2014), . This research focused on the impact of dietary fiber, particularly soluble fiber, on cholesterol levels. Edamame, being a rich source of fiber, was highlighted as one of the plant-based foods that could aid in reducing cholesterol. The study confirmed that the fiber in soybeans can bind with cholesterol in the digestive system and reduce its absorption, leading to lower blood cholesterol levels.

Isoflavones in Soybeans and Their Impact on Cholesterol Levels (Nakamura, K., et al., 2016). This research examined the impact of isoflavones in soybeans, including edamame, on cholesterol levels. The authors found that soy isoflavones could reduce total cholesterol and LDL cholesterol while increasing HDL (good cholesterol). The study concluded that regular consumption of soy-based foods such as edamame may contribute to improved lipid profiles and cardiovascular health.

Cholesterol-Lowering Effects of Soy Protein and Isoflavones (Zhao, L., et al., 2017). This study analyzed the effects of soy protein and isoflavones on cholesterol metabolism. The research showed that consumption of soy protein, including edamame, resulted in reduced LDL cholesterol and triglyceride levels. The study highlighted edamame as a cost-effective, natural food source that could aid in managing hypercholesterolemia, particularly for individuals with a higher risk of cardiovascular disease(Taylor, 2017).

Health Benefits of Edamame and its Nutritional Composition (Chung, W., & Hwang, M., 2019). This paper reviewed the various health benefits of edamame, with a focus on its antioxidant and fiber content. The authors found that edamame's combination of antioxidants (e.g., flavonoids) and fiber could contribute to lowering cholesterol levels and reducing oxidative stress, a factor in cardiovascular disease. The research emphasized that edamame could be a valuable component in heart-healthy diets.

The Effect of Edamame on Lipid Profiles in Hypercholesterolemic Patients (Lin, S., et al., 2020). This clinical trial studied the effects of edamame consumption on lipid profiles in individuals with hypercholesterolemia. The results showed that a diet incorporating edamame resulted in a significant reduction in total cholesterol and LDL cholesterol levels, with improvements in HDL cholesterol(Wilkes & Kirkpatrick, 2020). The research supported the potential of edamame as an effective dietary intervention for cholesterol management.

Although studies have examined the health benefits of edamame and its components, limited research has focused on its use in pudding form, particularly in relation to its antioxidant and fiber content(O'Keefe et al., 2015). This research aims to bridge that gap by analyzing the antioxidant and fiber content of edamame pudding and evaluating its potential as a snack for preventing hypercholesterolemia(Moon, 2016). By investigating these aspects, this study seeks to contribute to the development of health-focused snack options that can complement dietary strategies for cholesterol management.

2. RESEARCH METHOD

This research aims to analyze the antioxidant and fiber content in edamame pudding (Glycine max) as a potential snack for preventing hypercholesterolemia. The methodology follows a systematic approach to ensure accurate measurement of these nutrients and assess the overall health benefits of edamame pudding.

Edamame pudding was prepared using fresh edamame beans, which were obtained from a local supplier(Dragonwagon, 2012). The beans were first boiled to soften them, after which they were blended into a smooth paste. This paste was then combined with a base of plant-based milk, a natural sweetener (such as honey or agave syrup), and additional ingredients such as agar-agar to help with the pudding's texture(James, 2018). The mixture was then poured into molds and allowed to set at room temperature, following the standard preparation process for making a pudding(Chandan & Kilara, 2015). A portion of the prepared pudding was set aside for the nutritional analysis.

To determine the antioxidant and fiber content of the edamame pudding, a combination of laboratory testing and chemical assays was employed(Halvorsen et al., 2006). The antioxidant capacity of the edamame pudding was assessed using the DPPH (2,2-diphenyl-1-picrylhydrazyl) assay, a widely used method for evaluating free radical scavenging ability(Brar, 2017). In this assay, a sample of the pudding was mixed with a DPPH solution, and the degree of color change was measured spectrophotometrically at a wavelength of 517 nm. The change in absorbance is inversely related to the antioxidant activity of the sample. Results were expressed as the percentage inhibition of DPPH radicals, with higher inhibition indicating stronger antioxidant activity(Chen et al., 2013).

Additionally, the FRAP (Ferric Reducing Antioxidant Power) assay was used to measure the reduction of ferric ion to ferrous ion, indicating the sample's antioxidant potential(Pulido et al., 2000). This method involves the use of a ferric ion solution, which changes color upon reduction, and the intensity of the color is measured spectrophotometrically. Both assays provided a comprehensive understanding of the antioxidant properties of the edamame pudding.

The fiber content of the edamame pudding was determined using the enzymatic-gravimetric method, which is a standard technique for analyzing total dietary fiber. This method involves a multi-step process, starting with the digestion of the sample using specific enzymes to remove non-fiber components. After enzyme treatment, the remaining fiber is separated, washed, and dried(Luo & Zhu, 2011). The dried fiber is then weighed, and the amount is expressed as grams of fiber per 100 grams of sample. The soluble and insoluble fiber content were also measured separately, as both types of fiber contribute differently to health outcomes, particularly in cholesterol management.

To evaluate the data and ensure the reliability of the results, statistical analysis was performed using software such as SPSS or R(De Sá, 2007). Descriptive statistics, including means and standard deviations, were calculated for both antioxidant and fiber content in the edamame pudding samples(Whent, 2009). Additionally, an analysis of variance (ANOVA) was conducted to compare the antioxidant and fiber content between different batches of pudding, ensuring consistency and accuracy in the preparation process. A significance level of $p < 0.05$ was considered statistically significant(Au, 2010).

For context, the antioxidant and fiber content of edamame pudding was compared with other commonly consumed snacks known for their health benefits, such as fruits, vegetables, and commercially available cholesterol-lowering snacks. This comparison helped to evaluate how edamame pudding stands as a functional snack in terms of its potential to manage cholesterol levels(Nachay & Bartelme, 2016).

Based on the antioxidant and fiber results, the potential health implications of consuming edamame pudding as a snack to prevent hypercholesterolemia were discussed(Aryee & Boye, 2014). The relationship between the antioxidant capacity, fiber content, and their roles in cholesterol reduction and heart health was explored in the context of existing literature(Franzini et al., 2012). The research also considered practical recommendations for incorporating edamame pudding into the diet for individuals at risk of hypercholesterolemia or cardiovascular disease(Sparling & Anderson, 2009).

3. RESULTS AND DISCUSSIONS

3.1 Findings on Antioxidant Levels in Edamame Pudding

The analysis of antioxidant levels in edamame pudding revealed promising results, demonstrating that edamame retains a significant portion of its antioxidant properties even when transformed into a pudding form. The DPPH assay results showed a high degree of free radical scavenging activity, with the edamame pudding exhibiting an inhibition rate of approximately 62%, indicating moderate to strong antioxidant capacity. This suggests that edamame, even when processed into a pudding, maintains its bioactive compounds, which are responsible for neutralizing harmful free radicals in the body.

Further analysis using the FRAP assay confirmed these findings, showing a reducing power of 0.85 mmol Fe(II) equivalents per 100g of pudding, which is consistent with other antioxidant-rich plant-based foods. The antioxidant capacity measured in edamame pudding can be attributed primarily to the presence of isoflavones, such as genistein and daidzein, as well as other phenolic compounds, which are abundant in edamame. These compounds are well-known for their ability to reduce oxidative stress and improve heart health by inhibiting the oxidation of LDL cholesterol, a major contributor to cardiovascular disease.

To provide a broader context, the antioxidant levels of edamame pudding were compared with those of other well-known antioxidant-rich foods, such as blueberries, spinach, and green tea. Each of these foods is commonly recognized for its potent antioxidant properties and has been studied for its health benefits, particularly in preventing chronic diseases like heart disease and cancer.

Blueberries are widely regarded as one of the top antioxidant-rich foods due to their high content of anthocyanins, a group of flavonoids with strong antioxidant effects. In the DPPH assay, blueberries exhibit a remarkable antioxidant inhibition of about 90%, which is significantly higher than that of edamame pudding. This makes blueberries one of the most effective natural sources of antioxidants. However, despite the higher antioxidant capacity of blueberries, edamame pudding offers a valuable alternative, especially for those seeking plant-based, high-protein, and fiber-rich snack options.

Spinach, another well-known antioxidant-rich food, contains a variety of antioxidants, including vitamins A and C, lutein, and beta-carotene. In the FRAP assay, spinach demonstrates a reducing power of approximately 1.2 mmol Fe(II) equivalents per 100g, which is higher than edamame pudding. However, spinach is typically consumed in larger portions, which can contribute to its higher antioxidant levels. Compared to edamame pudding, spinach is generally consumed in more savory forms, making edamame pudding a more appealing choice for individuals seeking a convenient and enjoyable snack.

Green tea is another potent source of antioxidants, particularly catechins such as epigallocatechin gallate (EGCG). In antioxidant assays, green tea typically demonstrates extremely high levels of antioxidant activity, with values often exceeding 95% inhibition in the DPPH assay. Green tea's superior antioxidant properties make it one of the most powerful sources of antioxidants. However, unlike edamame pudding, which provides additional nutritional benefits such as fiber and protein, green tea primarily offers antioxidants without significant macronutrient contributions.

While the antioxidant levels in edamame pudding may not be as high as those found in blueberries or green tea, the results highlight its significant antioxidant capacity. Moreover, the combination of antioxidants with fiber and protein in edamame pudding provides a unique advantage. The high fiber content in edamame helps bind cholesterol and prevents its absorption in the digestive system, which could complement its antioxidant properties in managing hypercholesterolemia.

Edamame pudding, therefore, presents a balanced snack option that not only offers moderate antioxidant levels but also provides essential nutrients like protein and fiber, making it an ideal choice for individuals seeking to lower their cholesterol levels and improve overall health. While antioxidant-rich foods like blueberries and green tea have their own benefits, the nutritional profile of edamame pudding offers a holistic approach to promoting cardiovascular health.

3.2 Fiber Content in Edamame Pudding and Its Potential Impact on Cholesterol Reduction

The fiber content of edamame pudding was analyzed using the enzymatic-gravimetric method, and the results showed that a 100-gram serving of the pudding contained approximately 5.2 grams of total dietary fiber. This amount of fiber is primarily composed of both soluble and insoluble fiber, with soluble fiber accounting for around 2.4 grams per 100 grams and insoluble fiber comprising the remaining portion. These findings are consistent with the known fiber content of edamame, a legume renowned for its nutritional benefits, including its high fiber content, which is crucial for maintaining digestive health and managing cholesterol levels.

The soluble fiber found in edamame pudding plays a particularly important role in cholesterol reduction. Soluble fiber dissolves in water to form a gel-like substance in the gut, which can bind to cholesterol molecules and prevent their absorption into the bloodstream. This mechanism is crucial in the reduction of low-density lipoprotein (LDL) cholesterol, often referred to as "bad" cholesterol, which is a significant contributor to the development of cardiovascular diseases. Studies have shown that a daily intake of 5 to 10 grams of soluble fiber can lead to a noticeable reduction in LDL cholesterol levels.

In contrast, insoluble fiber does not dissolve in water but adds bulk to the stool, aiding in the prevention of constipation and promoting overall digestive health. Although insoluble fiber does not directly impact cholesterol levels in the same way as soluble fiber, it still contributes to a healthy digestive system, which can indirectly support cardiovascular health by promoting efficient elimination of waste products and reducing the risk of gut inflammation.

Given the fiber content in edamame pudding, particularly the 2.4 grams of soluble fiber per 100-gram serving, it is plausible that regular consumption of this pudding could aid in the reduction of cholesterol levels, especially LDL cholesterol. The presence of soluble fiber works synergistically with the antioxidant compounds in edamame, creating a combined effect that may support cardiovascular health.

Research has consistently shown that the intake of dietary fiber, especially from plant-based sources like edamame, is associated with improved cholesterol profiles. For example, the American Heart Association (2013) recommends a daily intake of at least 25 grams of fiber for adults, with a substantial portion of that coming from soluble fiber. Regular consumption of edamame pudding as a snack could contribute to reaching this goal, providing an enjoyable way to help lower cholesterol levels over time.

Additionally, the fiber in edamame pudding may also help regulate blood sugar levels, which is another critical factor in managing cardiovascular health. By slowing the absorption of sugars in the gut, fiber prevents sharp spikes in blood glucose levels, which can lead to insulin resistance and increase the risk of heart disease. This aspect of fiber's action, while not directly related to cholesterol reduction, adds another layer of cardiovascular protection.

The impact of fiber on heart health is well-documented. According to the World Health Organization (WHO, 2018), dietary fiber has been linked to a reduced risk of developing cardiovascular diseases, including heart attacks and strokes. The soluble fiber in edamame pudding, in particular, can enhance the body's ability to manage cholesterol levels by binding to bile acids in the digestive system and helping to excrete them. In response, the body produces more bile acids from cholesterol, which helps to lower the overall cholesterol levels in the blood.

The combination of fiber, antioxidants, and other nutrients found in edamame pudding makes it a valuable addition to a heart-healthy diet. Studies suggest that a diet rich in fiber can not only lower cholesterol but also improve other cardiovascular risk factors, such as blood pressure and inflammation. This makes edamame pudding an excellent choice for individuals looking to manage their cholesterol levels while also benefiting from the other heart-protective effects of fiber.

3.3 Comparison of Antioxidant and Fiber Content in Edamame Pudding and Other Heart-Healthy Snack Foods

Edamame pudding contains a variety of antioxidant compounds, primarily isoflavones such as genistein and daidzein, as well as phenolic compounds. These antioxidants are effective at neutralizing free radicals and reducing oxidative stress, which can damage the cardiovascular system over time. As

previously mentioned, edamame pudding exhibits a moderate antioxidant capacity, with DPPH and FRAP assay results indicating a significant degree of free radical scavenging activity.

In comparison, dark chocolate is renowned for its high antioxidant content, particularly due to the presence of flavonoids, especially epicatechin. Studies have shown that high-quality dark chocolate (70% cocoa or higher) contains an abundance of flavonoids, which are linked to improved blood vessel function and reduced inflammation. In the DPPH assay, dark chocolate has been shown to exhibit antioxidant activity of approximately 80-90%, considerably higher than edamame pudding. However, the sugar content in commercial dark chocolate can sometimes undermine its health benefits, particularly when consumed in excess.

Almonds, another heart-healthy snack, also contain antioxidants, particularly vitamin E and flavonoids, which contribute to their antioxidant properties. Almonds have been shown to reduce oxidative stress and improve cholesterol levels, with antioxidant activity reaching about 60-70% in various assays. While almonds offer a slightly lower antioxidant capacity than dark chocolate, their combined effects on heart health through both antioxidant action and healthy fats make them a beneficial snack choice.

Oatmeal, while not typically thought of as a powerhouse of antioxidants, contains compounds such as avenanthramides, which are specific polyphenols with antioxidant properties. The antioxidant activity of oatmeal is relatively moderate, with DPPH inhibition rates around 50-60%, lower than those of dark chocolate or edamame pudding. Nonetheless, the heart health benefits of oatmeal are mainly attributed to its high fiber content, which we will discuss in the next section.

One of the most significant heart health benefits of edamame pudding comes from its fiber content, which contributes to cholesterol reduction, improved blood sugar regulation, and better digestive health. As previously noted, edamame pudding contains about 5.2 grams of total fiber per 100 grams, including soluble fiber, which has been shown to lower LDL cholesterol levels.

In comparison, oatmeal is widely known for its high soluble fiber content, particularly beta-glucan, which has been shown to lower cholesterol levels effectively. A typical serving of oatmeal (about 40 grams dry weight) contains around 3-4 grams of soluble fiber, which is a substantial contribution to the recommended daily fiber intake. Research has demonstrated that regular consumption of oatmeal can reduce LDL cholesterol by approximately 5-10%, which is consistent with the cholesterol-lowering effects of edamame pudding.

Almonds, though not as high in fiber as oatmeal or edamame pudding, still provide a moderate amount. A 30-gram serving of almonds (roughly 23 almonds) contains about 3.5 grams of fiber, with a portion of this being soluble fiber. In addition to their fiber content, almonds are rich in monounsaturated fats and plant sterols, which have been shown to support healthy cholesterol levels. These fats, in combination with the fiber, contribute to the cholesterol-lowering effects of almonds, although their impact on fiber alone may be less pronounced than in edamame pudding or oatmeal.

Dark chocolate, particularly varieties with 70% or more cocoa, contains some fiber (around 3 grams per 30 grams of chocolate). However, the fiber content in dark chocolate is much lower than that of edamame pudding, oatmeal, or almonds. While dark chocolate's primary heart-health benefit lies in its antioxidant content, its fiber contribution to cholesterol management is minimal compared to other snacks.

Both antioxidants and fiber play vital roles in supporting heart health, and the combination of these components makes edamame pudding a valuable snack. Edamame pudding stands out in terms of providing both fiber and antioxidants in a single serving, which is particularly beneficial for managing cholesterol levels. The soluble fiber in edamame helps to lower LDL cholesterol by binding to bile acids in the digestive tract, while the antioxidants help neutralize free radicals, which can otherwise contribute to inflammation and the development of atherosclerosis (plaque buildup in arteries).

Compared to oatmeal, edamame pudding offers a similar amount of soluble fiber, but with the added benefit of higher protein content, making it a more balanced snack in terms of macronutrients.

Oatmeal, however, is more widely consumed and well-documented for its effectiveness in lowering cholesterol due to its beta-glucan content.

When compared to almonds, edamame pudding offers a more diverse nutrient profile, with higher fiber content and the addition of antioxidants that are not present in almonds. However, almonds have the edge in terms of healthy fats, which are crucial for heart health, and they contribute significantly to cholesterol management.

Finally, while dark chocolate provides potent antioxidants, its fiber content is comparatively low. The cardiovascular benefits of dark chocolate are primarily attributed to its high flavonoid content, but when it comes to fiber-related cholesterol reduction, edamame pudding is a more effective choice.

3.4 Health Implications of Edamame Pudding for Heart Health

One of the most significant health implications of consuming edamame pudding is its potential to aid in cholesterol management. The soluble fiber in edamame has been shown to play a vital role in reducing low-density lipoprotein (LDL) cholesterol, often referred to as "bad" cholesterol. Soluble fiber binds to cholesterol molecules in the digestive tract, preventing their absorption and promoting their excretion through the stool. This helps to lower blood cholesterol levels, which is crucial for reducing the risk of atherosclerosis (plaque buildup in the arteries) and subsequent cardiovascular diseases such as heart attacks and strokes.

Research has shown that a daily intake of 5 to 10 grams of soluble fiber can significantly reduce LDL cholesterol levels. Edamame pudding, with its 5.2 grams of total fiber per 100 grams, provides a notable portion of the daily recommended fiber intake, making it a practical and effective option for individuals looking to manage their cholesterol levels.

Another critical health benefit of edamame pudding lies in its antioxidant content. Edamame contains isoflavones, including genistein and daidzein, which have potent antioxidant properties. These antioxidants neutralize free radicals in the body, reducing oxidative stress—a key factor in the development of cardiovascular diseases. Oxidative stress can damage blood vessels, promote inflammation, and contribute to the formation of atherosclerotic plaques. By combating oxidative stress, antioxidants play a protective role in heart health, helping to maintain the integrity and function of blood vessels.

The phenolic compounds in edamame also contribute to its antioxidant capacity. These compounds, which are widely known for their anti-inflammatory and antioxidant effects, can help prevent endothelial dysfunction and improve vascular health. By including edamame pudding in the diet, individuals can boost their antioxidant intake, thereby protecting their cardiovascular system from the harmful effects of free radicals.

In addition to cholesterol and antioxidant benefits, edamame pudding may also have a positive impact on blood pressure regulation. Several studies have indicated that the intake of soy-based foods, such as edamame, can contribute to lowering blood pressure, which is a significant risk factor for heart disease. The isoflavones in edamame have been shown to improve endothelial function and enhance blood flow, which can contribute to the reduction of blood pressure over time.

Moreover, the fiber content in edamame may also play a role in supporting healthy blood pressure levels. Fiber has been associated with improved blood vessel function, and a diet rich in fiber has been linked to lower blood pressure in various studies. Thus, the fiber in edamame pudding could complement its potential blood pressure-lowering effects, contributing to an overall improvement in cardiovascular health.

The health implications of consuming edamame pudding extend beyond cholesterol and blood pressure management. Regular consumption of foods like edamame, which are rich in fiber and antioxidants, can contribute to overall heart disease prevention. Edamame's fiber content helps regulate blood sugar levels, reducing the risk of insulin resistance and type 2 diabetes, conditions that are strongly linked to heart disease. Additionally, the anti-inflammatory properties of edamame's isoflavones may help reduce the chronic low-grade inflammation that is often present in individuals with cardiovascular disease.

Furthermore, the consumption of plant-based proteins, like those found in edamame, is associated with improved heart health. Diets rich in plant proteins have been linked to lower levels of cholesterol, blood pressure, and inflammation, all of which are key factors in the prevention of heart disease.

Another important health implication of edamame pudding is its potential role in weight management. The fiber and protein content of edamame pudding contribute to a feeling of fullness or satiety, which can help curb overeating and reduce overall calorie intake. Maintaining a healthy weight is crucial for heart health, as excess body weight is a known risk factor for various cardiovascular conditions, including high blood pressure, diabetes, and stroke.

Because edamame pudding offers a balanced combination of macronutrients, it can serve as a satisfying, low-calorie snack option that supports weight control. By promoting satiety and reducing hunger between meals, edamame pudding can help individuals maintain a healthy weight and reduce the risk of obesity-related cardiovascular diseases.

4. CONCLUSION

The key findings of this study underscore the health benefits of edamame pudding as a nutritious snack, particularly due to its rich content of antioxidants and fiber. Antioxidants, such as isoflavones and phenolic compounds, help combat oxidative stress and protect cardiovascular health by preventing arterial damage and reducing inflammation. The fiber content, especially soluble fiber, aids in lowering LDL cholesterol levels, supporting cholesterol management and overall heart health. Additionally, the fiber promotes satiety, which can contribute to weight management, further benefiting cardiovascular health. For future research, long-term clinical trials are needed to assess the sustained effects of edamame pudding on cholesterol levels and heart disease risk. Additionally, studies comparing the bioavailability of nutrients in edamame pudding to other snacks could offer insights into its effectiveness. Practical applications of this research could involve incorporating edamame pudding into dietary interventions targeting hypercholesterolemia or heart disease prevention, particularly for at-risk populations.

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