

CHAPTER I

INTRODUCTION

1.1 Research Background

In Indonesia, the incidence of cardiovascular diseases continues to rise each year.¹ This disease has shown a significant increase and is the seventh leading cause of death worldwide.² Elevated blood glucose levels (hyperglycemia) are among the most critical risk factors influencing the prevalence and prognosis of cardiovascular diseases.³ An unhealthy lifestyle contributes to increased blood glucose levels due to excessive and imbalanced dietary intake. This aligns with the words of Allah SWT in the Qur'an, Surah Tāhā (20:81):

كُلُوا مِنْ طَيِّبَاتِ مَا رَزَقْنَاكُمْ وَلَا تَطْغَوْا فِيهِ فَيَحِلَّ عَلَيْكُمْ غَضَبِي وَمَنْ يَحْلِلْ
عَلَيْهِ غَضَبِي فَقَدْ هَوَىٰ ﴿٨١﴾

“Eat from the good things We have provided for you, and do not transgress, lest My wrath should befall you. And whoever My wrath befalls is certainly doomed”.⁴

¹ Almita Mila Susanti dan Siti Cholifah, “Pengaruh Pemberian Jus Tomat Terhadap Kadar Gula Darah Sewaktu Pada Pasien Hiperglikemia” *Nusantara Hasana Journal* 1, no. 3 (2021).

² Tista Ayu Fortuna dkk., “Faktor – Faktor yang Mempengaruhi Komplikasi pada Pasien Diabetes Mellitus di RSUD Dr. Moewardi,” *Pharmacon: Jurnal Farmasi Indonesia* 20, no. 1 (1 Juli 2023): 27–35, <https://doi.org/10.23917/pharmacon.v20i1.21877>.

³ Junior I.K.P., Swastini D.A., dan Leliqia N.P.E., “Pengaruh Pemberian Ekstrak Etanol Kulit Kacang Tanah Dengan Metode Maserasi Terhadap Profil Lipid Pada Tikus Sprague Dawley Diet Lemak Tinggi,” *Nusantara Journal* (2015).

⁴ “Surat Thaha Ayat 81: Arab, Latin, Terjemah Dan Tafsir Lengkap | Quran NU Online,” diakses 23 Juni 2024, <https://quran.nu.or.id/thaha/81>.

Blood glucose originates from carbohydrates in food, and any excess is stored as glycogen in the liver and skeletal muscles. Elevated blood glucose levels can lead to various diseases, one of which is Type 2 Diabetes Mellitus (DM).⁵ Type 2 Diabetes Mellitus (Non-Insulin Dependent Diabetes Mellitus, NIDDM) is a metabolic disorder characterized by hyperglycemia and impaired metabolism of carbohydrates, fats, and proteins associated with insulin deficiency or dysfunction.⁶ Although Diabetes Mellitus cannot be cured, it can be managed effectively. According to the World Health Organization (WHO), Diabetes Mellitus is the third leading cause of death worldwide, with Indonesia ranking as the fourth highest country in terms of diabetes prevalence. Lifestyle factors significantly contribute to the risk of developing Type 2 Diabetes Mellitus, particularly dietary habits that lead to an imbalance in energy, carbohydrate, and protein intake. A diet high in energy-dense foods (rich in fats and sugars) and low in fiber is strongly associated with elevated blood glucose levels.⁷

The treatment of diabetes mellitus can be approached through various methods, one of which is the use of herbal medicine derived from plants. One such plant with potential therapeutic effects is peanuts (*Arachis hypogaea* L.). Peanuts belong to the legume family and serve as a primary source of vegetable oil and a protein-rich food. In addition to their nutritional benefits, peanuts have been shown to reduce the risk of cardiovascular diseases by lowering low-density lipoprotein (LDL) levels and may also help decrease the risk of Type 2 Diabetes Mellitus, so far, the utilization of peanuts has been largely limited to their seeds, which are processed

⁵ Khairiah Kartini, Akhmad Khumaidi, dan Khildah Khaerati, "Ekstrak Etanol Daun Eboni Menurunkan Kadar Glukosa Darah Tikus Jantan yang Diinduksi Aloksan," *Jurnal Veteriner* 19, no. 3 (2018).

⁶ Ersalina Nidianti, Devyana Dyah Wulandari, dan Chika Nur Azizah, "Efek Pemberian Ekstrak Kacang Tanah (*Arachis hypogaea* L.) Terhadap Kadar Gula Darah pada Mencit (*Mus musculus* L)," *Borneo Journal of Pharmascientech* 7, no. 1 (5 April 2023): 6–11, <https://doi.org/10.51817/bjp.v7i1.433>.

⁷ Verhoeven Chelzea dan Yekti Wirawanni, "Pengaruh Pemberian Selai Kacang Tanah Dengan Substitusi Bekatul Merah Terhadap Kadar Glukosa Darah Tikus Diabetes," *Journal of Nutrition College* 4, no. 4 (1 Oktober 2015): 423–27, <https://doi.org/10.14710/jnc.v4i4.10120>.

into various snack products or cooking ingredients.⁸ However, peanut shells, which are often regarded as waste by society, actually contain beneficial compounds for health, such as fiber, polyphenols, and flavonoids. These bioactive compounds exhibit antioxidant and anti-inflammatory properties and may also contribute to reducing blood glucose levels.⁹

Peanut shells contain flavonoid compounds, which exhibit antidiabetic effects by enhancing insulin secretion from pancreatic cells and improving insulin sensitivity.^(10,11) flavonoids can enhance insulin absorption by modulating GLUT4.¹² Studies have shown that flavonoids exhibit hypoglycemic activity by inhibiting carbohydrate-hydrolyzing enzymes such as amylase, glucosidase, and disaccharidase.¹³ Based on above background, this study aims to evaluate the effect of ethanolic extract of peanut (*Arachis hypogaea* L.) shells on blood glucose levels in white rats (*Rattus norvegicus*).

⁸ Tri Hanni Desiana Putri dan Enny Probosari, "Pengaruh Pemberian Kacang Tanah Kukus (*Arachis Hypogaea*) Terhadap Kadar Glukosa Darah Postprandial Pada Perempuan Overweight Dan Obesitas," *Journal of Nutrition College* 3, no. 1 (27 Januari 2014): 222–27, <https://doi.org/10.14710/jnc.v3i1.4600>.

⁹ Yuvianti Dwi Franyoto dan Lia Kusmita, "Uji Aktivitas Antioksidan Dan Formulasi Sediaan Krim Ekstrak," *Jurnal Ilmiah Cendekia Eksakta*, 2019.

¹⁰ Shehrina Nazmin dan Nayma Sultana, "Anti-Diabetic Effect of Metformin Combined With Peanut (*Arachis Hypogaea* L.) on Streptozotocin Induced Diabetic Rats," *Journal of Bangladesh Society of Physiologist* 13, no. 2 (26 Desember 2018): 59–67, <https://doi.org/10.3329/jbsp.v13i2.39479>.

¹¹ Annisa Amriani S dkk., "Uji Aktivitas Antidiabetes Ekstrak Etanol Akar Kabau (*Archidendron bubalinum* (Jack) I.C. Nielsen) terhadap Tikus Putih Jantan yang Diinduksi Diet Tinggi Lemak dan Fruktosa," *Jurnal Penelitian Sains* 23, no. 2 (8 Juli 2021): 102, <https://doi.org/10.56064/jps.v23i2.635>.

¹² Kae Won Cho dkk., "Daidzein and The Daidzein Metabolite, Equol, Enhance Adipocyte Differentiation and PPAR γ Transcriptional Activity," *The Journal of Nutritional Biochemistry* 21, no. 9 (September 2010): 841–47, <https://doi.org/10.1016/j.jnutbio.2009.06.012>.

¹³ Kenjiro Tadera dkk., "Inhibition of α -Glucosidase and α -Amylase by Flavonoids," t.t.; Danielle Fontana Pereira dkk., "Effects of Flavonoids on α -Glucosidase Activity: Potential Targets For Glucose Homeostasis," *Nutrition* 27, no. 11–12 (November 2011): 1161–67, <https://doi.org/10.1016/j.nut.2011.01.008>.

1.2 Research Problem

The research questions in this study are as follows:

1. Does the ethanol extract of peanut shells (*Arachis hypogaea* L.) exhibit antidiabetic activity in glucose-induced white rats (*Rattus norvegicus*)?
2. How does the reduction in blood glucose levels compare among white rats (*Rattus norvegicus*) induced with glucose following the administration of various doses of ethanolic extract of peanut shells (*Arachis hypogaea* L.)?

1.3 Research Objectives

The objectives of this study are:

1. To evaluate the antidiabetic activity of ethanol extract of peanut shells (*Arachis hypogaea* L.) in glucose-induced white rats (*Rattus norvegicus*).
2. To determine the comparative reduction in blood glucose levels in white rats (*Rattus norvegicus*) induced with glucose after receiving different doses of ethanol extract of peanut shells (*Arachis hypogaea* L.).

1.4 Research Benefits

1. Theoretical Benefits

The results of this study can be used as reference material for further research on the effect of flavonoids on lowering blood sugar levels.

2. Practical Benefits

The results of this study are expected to add to the repertoire of science and provide readers with insight, especially about the effect of the ethanol extract of peanut shells on lowering blood sugar levels.

1.5 Authenticity of Research

Previous studies have examined peanut skin extract's effect on human blood sugar levels. The novelty of this study is the effect of peanut shell ethanol extract on reducing blood sugar levels in white rats (*Rattus norvegicus*) induced by glucose.

Table 1. Authenticity of Research

Research Title	Research Method	Variable	Result	Research Differences
Peanut skin phenolic extracts to attenuate hyperglycemic responses in vivo and in vitro. ¹⁴	Experimental	Dependent: Blood sugar levels Independent: Peanut skin phenolic extracts	Peanut shell extract can reduce cell viability in high glucose-treated HepG2 cells, indicating a protective effect against hyperglycemia-induced cell death. There was no difference in the glycemic response area under the curve between the treatments using the tolerance test and the extract treatment. Glucose-referenced peanut shells produced a significantly lower peak blood glucose response at 45 minutes, indicating that the extract effectively reduced the glycemic response.	Dependent: Blood sugar levels Independent: Ethanol extract of peanut shells doses of 100, 200, 400 mg/kgBW.

¹⁴ Lindsey M. Christman dkk., "Peanut Skin Phenolic Extract Attenuates Hyperglycemic Responses In Vivo and In Vitro," ed. oleh Gianfranco Pintus, *PLOS ONE* 14, no. 3 (27 Maret 2019): e0214591, <https://doi.org/10.1371/journal.pone.0214591>.

Research Title	Research Method	Variable	Result	Research Differences
Effect of steamed peanut (<i>Arachis hypogaea</i> L.) on postprandial blood glucose levels in overweight and obese women. ¹⁵	Experimental	Dependent: Blood sugar levels Independent: Steamed peanuts	Giving 28 grams of steamed peanuts for 14 days caused a significant reduction in postprandial blood glucose levels.	Dependent: Blood sugar levels Independent: Ethanol extract of peanut shells doses of 100, 200, 400 mg/kgBW.

¹⁵ Desiana Putri dan Probosari, "Pengaruh Pemberian Kacang Tanah Kukus (*Arachis Hypogaea*) Terhadap Kadar Glukosa Darah Postprandial Pada Perempuan Overweight Dan Obesitas." *Journal of Nutrition College* 3, No. 1 (Januari 2014): 222-227, <https://ejournal3.undip.ac.id/index.php/jnc/article/view/4600>.