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REVIEW

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Porang (*Amorphophallus muelleri* Blume) and its potential in diabetes management

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Abstract: Diabetes mellitus remains one of the most pressing global health challenges, driving the search for natural alternatives to conventional therapies. This review explores the potential of *porang* (*Amorphophallus muelleri* Blume) as a promising intervention for diabetes management. Porang is rich in glucomannan, a soluble dietary fiber with diverse therapeutic properties. Modern extraction methods can achieve glucomannan purity exceeding 90%, with ongoing advancements improving yield and quality. Mechanistically, porang exerts antidiabetic effects through multiple pathways, including enhanced insulin gene expression, improved insulin signaling, and reduced glucose absorption. Experimental studies in diabetic animal models demonstrate significant glucose-lowering effects, with blood glucose reductions of up to 50% alongside increased pancreatic β-cell counts. Beyond glycemic control, porang mitigates diabetic complications, reducing glomerulosclerosis and preserving reproductive function. It also offers broader metabolic benefits, such as improved lipid profiles, reduced inflammatory markers, and enhanced gut health via increased short-chain fatty acid production. While current evidence is promising, further clinical studies are needed to optimize dosing, formulations, and long-term efficacy in humans. Nevertheless, porang's multifaceted therapeutic profile positions it as a viable complementary approach within comprehensive diabetes management strategies.

Keywords: porang, Amorphophallus muelleri, glucomannan, diabetes mellitus

Introduction

Diabetes mellitus represents one of the most significant global health challenges of the 21st century, characterized by chronic hyperglycemia resulting from defects in insulin secretion, insulin action, or both. The prevalence of diabetes has risen exponentially worldwide despite significant advances in treatment modalities and preventive measures [1]. This metabolic disorder affects multiple organ systems and leads to numerous severe complications, including nephropathy, retinopathy, neuropathy, and cardiovascular disease, significantly impacting the quality of life and increasing mortality risk in affected individuals [2].

While conventional diabetes management relies heavily on pharmaceutical interventions, increasing interest has emerged in complementary approaches utilizing natural products. This shift toward exploring natural alternatives stems from the rising costs of conventional medications, concerns about the long-term side effects of synthetic drugs, and growing evidence supporting the efficacy of certain plant-derived compounds in modulating glucose metabolism [3]. Traditional medicine systems worldwide have historically employed various plant species for managing diabetes and its symptoms, providing a rich source of potential therapeutic agents awaiting scientific validation.

Among these promising natural interventions, porang (*Amorphophallus muelleri* Blume or *Amorphophallus oncophyllus*) has emerged as a plant of significant interest. This tuber-producing plant, belonging to the Araceae family, grows abundantly across the Indonesian archipelago, particularly in the forested regions of East Java [4]. While traditionally utilized in various culinary applications, porang's potential therapeutic properties have only recently gained scientific attention. The plant represents a notable example of how indigenous botanical resources can contribute to addressing global health challenges while potentially creating economic opportunities for local communities.

The distinguishing feature of porang that underlies its therapeutic potential is its exceptionally high glucomannan content. This natural polysaccharide is the primary bioactive component responsible for porang's health benefits, particularly in glucose metabolism and diabetes management [5]. The detailed chemical structure and properties of glucomannan

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are explored in subsequent sections, as they form the foundation for understanding porang's therapeutic mechanisms.

This review examines the current knowledge regarding porang and its potential applications in diabetes management. We will then progress to understanding the molecular mechanisms underlying its antidiabetic effects by exploring its chemical composition and extraction methods. This is followed by an examination of experimental evidence demonstrating its efficacy, its effects on preventing diabetic complications, and its broader metabolic impacts beyond glucose control. Through this structured approach, we seek to provide a holistic understanding of porang's therapeutic potential while identifying knowledge gaps and research opportunities to stimulate further scientific investigation into this promising natural intervention for addressing the global diabetes epidemic.

Method

This article presents the findings of a literature study on the potential of porang tuber (*Amorphophallus muelleri*) as a functional food diversification for diabetes mellitus patients. The method used in compiling this review article is a narrative review, which involves analyzing, collecting, and summarizing data from previous studies (published 2019 to 2024). The references were obtained from various databases, such as Google Scholar and PubMed, using a combination of keywords: "Porang tuber (*Amorphophallus muelleri*) and diabetes."

Chemical composition and extraction methods of porang

The purification of glucomannan from porang presents a significant challenge in post-harvest processing, as increasing glucomannan concentration is essential for expanding its market potential and applications. Investigations into optimal purification techniques have demonstrated that ethanol treatment significantly impacts glucomannan enhancement. A process involving washing with 50% ethanol and 2% sodium bisulfite ($NaHSO_3$) has been shown to increase glucomannan content, from 32.65% to 83.96%. Importantly, while ethanol treatment effectively increases glucomannan concentration, it did not negatively affect the iron (Fe) and calcium (Ca) content of porang flour, preserving these nutritionally valuable minerals [6]. This finding suggests that optimized purification methods can increase therapeutic properties while maintaining nutritional value.

The extraction efficiency of glucomannan is significantly influenced by processing parameters, particularly temperature and the ratio of raw material to solvent. Research examining isopropyl alcohol as a precipitating agent has found that extraction temperature exerts a considerable effect on yield, with optimal results obtained at 95°C producing a yield of 41.614%. Similarly, the ratio of porang tuber starch to solvent plays a crucial role, with the highest yield (45.167%) achieved at a 1:19 (w/v) ratio. These parameters provide valuable information for scaling up production while maintaining quality and efficacy.

Further refinements to extraction methodology have examined the relationship between porang powder, aqueous solvent ratios, and temperature. Optimized extraction of konjac glucomannan from porang tubers was achieved with a porang powder to aquadest ratio of 1:300 combined with heating at 55°C, which produced the highest yield and lowest moisture content [7]. These findings highlight the importance of precision in extraction parameters for maximizing glucomannan yield and quality, factors that directly impact its therapeutic efficacy in diabetes management applications.

Beyond traditional extraction methods, enzymatic approaches offer promising alternatives for producing specialized glucomannan derivatives. Producing oligo-glucomannan from porang glucomannan through enzymatic hydrolysis using β-mannanase represents an innovative approach to developing value-added products. Research has found that pretreatment with α-amylase enzymatic hydrolysis facilitates glucomannan extraction from raw porang flour. Varying enzyme concentrations (0.375, 0.625, 0.875 g/g) and extraction times (60, 90, 120 minutes) at 75°C with constant stirring produced hydrolyzed porang flour with glucomannan content ranging from 51.937% to 95.191%, with longer extraction times and higher enzyme concentrations yielding higher glucomannan content [8]. These enzymatically modified forms may offer enhanced bioactivity or improved pharmacokinetic properties for therapeutic applications.

A significant challenge in porang processing involves reducing calcium oxalate content, which can cause irritation and itching. Research has investigated

Table 1. Mechanisms of action of porang in diabetes management

Mechanism ategory	Specific pathway/target	Effect observed	Relevant biomarkers	Supporting evidence	Reference
Gene expression	Insulin gene	Increased mRNA levels of the insulin gene	Increased insulin gene mRNA	Glucomannan at 0.12 g/kg BW showed highest insulin gene expression in diabetic rats	[4]
Signaling pathways	Insulin receptor tyrosine kinase pathway	Improved insulin signal transduction	Increased IRS-1 and PI3-K expression	Significant enhancement of insulin signaling components in glucomannan-treated diabetic rats	[4]
Pancreatic function	β-cell regeneration/ protection	Increased number and function of pancreatic β-cells	Islets of Langerhans count, β-cell density	10% glucomannan supplementation increased islet count to 45.7 vs 15.7 in control	[1]
Glucose absorption	Intestinal glucose uptake	Delayed glucose absorption due to viscosity	Postprandial glucose levels	Reduced rate of glucose absorption in digestive tract	[5]
Oxidative stress	Free radical scavenging	Reduction in oxidative stress markers	Decreased MDA levels	Significant reduction in MDA in porang-treated diabetic rats	[10]
Inflammation	Pro-inflammatory cytokine regulation	Decreased inflammatory response	Reduced TNF-α levels	Lower TNF-α in rats receiving porang glucomannan with synbiotic kefir	[11]
Adipose tissue metabolism	PPARγ2 expression	Modulation of adipose tissue function	Decreased PPARγ2 gene expression	Down-regulation of PPARγ2 in rats fed HFHF diet with porang supplementation	[11]
Lipid metabolism	Cholesterol transport	Improved lipid profile	Decreased LDL levels	Significant reduction in LDL in diabetes patients consuming porang-processed rice	[12]
Glycemic control	Chronic glycemic regulation	Improved long-term glucose control	Reduced HbA1c levels	Decreased HbA1c in rats fed HFHF diet with porang glucomannan	[11]
Gut microbiota	Microbial fermentation	Enhanced production of beneficial metabolites	Increased SCFA levels	Highest SCFA levels (3.98±0.83 nmol/ml) at 50 mg/200g BW porang dose	[13]
Renal protection	Glomerular structure preservation	Reduced glomerulosclerosis	Glomerulosclerosis instances	Significant decrease in glomerulosclerosis in diabetic rats treated with porang extract	[2]
Reproductive system	Testicular tissue protection	Improved spermatogenesis and seminiferous tubule structure	Spermatogenesis score, tubule measurements	Enhanced testicular histopathology in diabetic rats receiving porang extract	[14]

the effects of soaking porang tubers in acetic acid solutions under varying conditions. Soaking at 60°C produced the greatest reduction in calcium oxalate (53.91%), while a 60-minute soaking duration resulted in a 42.54% reduction [9]. These findings provide practical approaches for reducing anti-nutritional factors in porang, enhancing its safety and acceptability for regular consumption in diabetes management regimens.

Structural analysis of extracted glucomannan reveals important features that influence its physiological effects. Spectroscopic analysis using Fourier Transform Infrared (FT-IR) spectroscopy confirms the presence of characteristic glucomannan functional groups in hydrolyzed porang flour. Scanning electron microscopy analysis demonstrates that enzymatically hydrolyzed porang flour exhibits a smoother surface than untreated flour. X-ray diffraction indicates reduced

crystallinity following hydrolysis, suggesting water was initially absorbed in amorphous areas with fewer hydrogen bonds [8]. These structural characteristics may influence glucomannan's behavior in the digestive system, affecting its interaction with nutrients and metabolism-modulating effects.

Mechanisms of action of porang/glucomannan in diabetes management

Understanding the molecular mechanisms behind porang's antidiabetic effects is crucial for establishing its therapeutic potential. Research has revealed several pathways through which glucomannan from porang exerts its beneficial effects on glucose metabolism (Table 1).

The role of glucomannan in modulating insulin gene expression represents a significant mechanism of action in diabetes management. Studies have demonstrated that glucomannan fiber from porang can significantly enhance mRNA levels of the insulin gene in diabetic rat models. When administered at an optimal dosage of 0.12 g/kg body weight, glucomannan produced the highest mRNA insulin gene expression among experimental groups, suggesting a direct influence on pancreatic function [4]. This modulation of insulin gene expression may contribute substantially to improved glycemic control in diabetic conditions.

Beyond gene expression, glucomannan activates critical signaling pathways involved in glucose metabolism. Research has identified that porang exerts its effects through the insulin receptor tyrosine kinase pathway. Administration of glucomannan significantly increases insulin receptor substrate-1 (IRS-1) expression levels and consistently enhances phosphatidylinositol 3-kinase (PI3-K) expression in diabetic rat models [4]. These molecular changes suggest that porang improves insulin signaling efficacy, which typically becomes impaired during diabetic states.

At the physiological level, porang significantly affects glucose homeostasis through multiple pathways. These molecular mechanisms ultimately translate to improved glycemic control, with the activation of insulin-related signaling cascades being a key factor in this process. The downstream effects include enhanced glucose uptake by peripheral tissues and improved regulation of hepatic glucose production [1].

Further investigation into porang's mechanisms reveals its potential anti-inflammatory effects in diabetic conditions. Research has explored the relationship between porang extract administration and inflammatory markers in alloxan-induced diabetic rats. Although some studies reported variable results regarding direct effects on inflammatory markers like C-reactive protein (CRP), significant differences were observed in malondialdehyde (MDA) levels after interventions with porang extract at various doses [10]. These findings suggest that porang's antidiabetic action may partially operate through the reduction of oxidative stress, which is closely linked to inflammatory processes in diabetes pathophysiology.

Additionally, the molecular mechanisms of porang may work synergistically with other bioactive compounds, particularly those with complementary actions such as antioxidants. This multi-faceted approach at the molecular level suggests that porang's primary mechanisms could be enhanced through strategic combinations that address multiple aspects of diabetes pathophysiology.

Antidiabetic effects of porang in experimental studies

Research using alloxan-induced diabetic rat models has consistently demonstrated the glucose-lowering effects of porang glucomannan. In one study, rats with severely elevated blood glucose levels (400-600 mg/dl) showed substantial improvement after glucomannan supplementation. Blood glucose levels decreased by approximately 50% (from 492 mg/dl to around 250 mg/dl) following 15 days of treatment with various concentrations of glucomannan, while control groups maintained high glucose levels of around 470 mg/dl [1]. This significant reduction highlights the potent hypoglycemic activity of porang glucomannan, even in severe hyperglycemic conditions.

The hypoglycemic effect of porang appears to be dose-dependent, with varying concentrations yielding different levels of efficacy. When three different concentrations of porang extract (100, 200, and 400 mg/kg body weight) were administered to alloxan-induced diabetic rats, significant differences in blood glucose levels were observed between negative control groups and the therapy groups receiving 200 and 400 mg/kg body weight doses. However, no significant difference was noted with the 800 mg/kg body weight dose, suggesting a potential therapeutic window for optimal efficacy [10]. This dose-response relationship provides valuable information for determining

effective therapeutic concentrations for future clinical applications.

Histological evidence further supports porang's beneficial effects on pancreatic morphology and function. Microscopic examination of pancreatic tissues from hyperglycemic rats treated with varying glucomannan concentrations revealed dose-dependent improvements in islet architecture. Quantitative analysis demonstrated progressive increases in the number of islets of Langerhans and β-cells corresponding to glucomannan concentration: 15.7 (control), 33.3 (2.5% glucomannan), 37.3 (5% glucomannan), and 45.7 (10% glucomannan) [1]. These histological improvements provide visual evidence of porang's ability to potentially restore pancreatic function, offering insights into the structural basis for the observed metabolic improvements.

The formulation of porang appears to influence its antidiabetic efficacy. A specially designed porang flour formulation consisting of 85% porang flour, 1.03% k-carrageenan flour, 12% inulin flour, and 1.97% modified cassava flour demonstrated significant effects on reducing fasting plasma glucose (FPG) in streptozotocin-induced diabetic rats. Additionally, this formulation decreased MDA levels, a marker of oxidative stress, and increased the number of pancreatic β-cells in diabetic rats. The porang fluor (300 mg/kg body weight) and middle-dose formulation showed promise, performing comparably to metformin, a standard antidiabetic medication [5]. These results highlight the potential for optimized porang formulations to achieve enhanced therapeutic outcomes.

Combining porang with other natural compounds may enhance its antidiabetic effects. When porang flour was macerated with *Strobilanthes crispus*, a plant rich in antioxidants, the combination demonstrated superior glucose-lowering effects compared to porang flour alone in streptozotocin-induced diabetic rats. This combination therapy produced results comparable to glibenclamide, a commercial antidiabetic medication, suggesting the potential for synergistic natural interventions [3]. This approach opens avenues for developing multi-component natural therapies that might address multiple aspects of diabetes pathophysiology simultaneously.

The insulin-sensitizing effects of porang have been examined through molecular studies. Administration of glucomannan at 0.12 g/kg body weight significantly enhanced insulin receptor substrate-1 (IRS-1) expression and consistently increased phosphatidylinositol 3-kinase (PI3-K) expression in diabetic rat models. These changes indicate improvements in insulin sensitivity, which typically becomes impaired during diabetic states [4]. By enhancing insulin signaling pathways, porang may address a fundamental mechanism of type 2 diabetes, offering a physiological approach to treatment.

Limited but promising clinical evidence exists regarding porang's antidiabetic effects in human subjects. A study on diabetes-diagnosed patients who consumed porang-processed rice showed significant reductions in low-density lipoprotein (LDL) levels ($p = 0.021$) compared to controls receiving white rice. Although no significant changes were observed in high-density lipoprotein (HDL) levels ($p = 0.102$), the study noted significant differences in the deviation between pre-test and post-test measurements for both LDL and HDL levels ($p = 0.002$; $p = 0.001$) [12]. These findings suggest that porang consumption may beneficially impact lipid profiles in diabetic patients, addressing an important comorbid factor in diabetes management.

In summary, experimental studies have established multiple antidiabetic effects of porang, including significant glucose-lowering properties, restoration of pancreatic tissues and function, enhancement of insulin sensitivity, and improvements in lipid profiles. The evidence spans various animal models and preliminary human studies, providing a solid foundation for further clinical investigation. The demonstrated dose-dependent effects and potential for synergistic combinations with other natural compounds offer promising directions for developing porang-based interventions for diabetes management.

Effects of porang on diabetic complications

Diabetes mellitus is characterized not only by hyperglycemia but also by numerous serious complications affecting multiple organ systems. Emerging research suggests that porang may offer protective benefits against several diabetes-induced complications, particularly those affecting renal and reproductive systems (Table 1).

Diabetic nephropathy represents one of the most severe complications of prolonged hyperglycemia, often manifesting as glomerulosclerosis and progressive kidney dysfunction. Research has investigated porang's potential protective effects against these renal

complications. In a controlled study using alloxan-induced diabetic Wistar rats, the administration of porang ethanolic extract resulted in a significant reduction in glomerulosclerosis instances compared to untreated diabetic control groups. The intervention involved three different dosage regimens (100, 200, and 400 mg/kg body weight), with the highest dose (400 mg/kg body weight) demonstrating the most pronounced protective effect on renal histopathology [2]. This significant reduction in glomerulosclerosis suggests that porang extract may help preserve renal structural integrity in diabetic conditions, potentially slowing the progression of kidney disease.

The protective mechanism behind porang's renal benefits likely involves multiple pathways. The glucomannan component of porang has been associated with reduced oxidative stress and inflammation, both critical factors in the pathogenesis of diabetic nephropathy. These effects may contribute to the preservation of glomerular structure and function observed in experimental models. Additionally, by improving glycemic control, porang may indirectly reduce the glucose-mediated damage to kidney tissues that typically occurs in chronic hyperglycemic states [2]. This multi-faceted approach to kidney protection highlights porang's potential as a complementary intervention for preventing or managing diabetic nephropathy.

Beyond renal complications, diabetes can significantly impact reproductive health, with male fertility often compromised due to hyperglycemia-induced testicular damage. Research on alloxan-induced diabetic rats has revealed promising protective effects of porang tuber extract on testicular histopathology. When administered at dosages of 100, 200, and 400 mg/kg body weight for 14 days, porang extract significantly improved spermatogenesis scores compared to untreated diabetic controls. Analysis using the Johnsen scoring system demonstrated that porang-treated groups maintained better spermatogenic activity, suggesting preservation of reproductive function despite diabetic conditions [14].

Further histological investigations revealed that porang extract positively affected testicular microstructure in diabetic rats. Measurements of seminiferous tubule diameter and epithelial thickness showed significant improvements in treated groups compared to diabetic controls. The groups receiving 100, 200, and 400 mg/kg body weight of porang extract demonstrated progressively enhanced tubular parameters, with seminiferous tubule diameter and epithelial thickness measurements more closely resembling those of non-diabetic controls [14]. These structural improvements likely translate to better functional outcomes in terms of reproductive capacity, suggesting porang's potential role in addressing diabetes-related male fertility issues.

The mechanisms underlying porang's protective effects on reproductive tissues may involve antioxidant properties, improved glycemic control, and direct tissue-protective actions. Diabetes-induced oxidative stress is a major contributor to testicular damage, and porang's documented antioxidant effects could help mitigate this damage. Additionally, by improving insulin sensitivity and glucose metabolism, porang may reduce the metabolic disruptions that typically affect spermatogenesis in diabetic conditions [14]. These multiple mechanisms highlight porang's comprehensive approach to protecting against diabetes-induced reproductive complications.

The observed protective effects of porang on both renal and reproductive systems suggest a broader potential for mitigating various diabetes-related complications. While research has primarily focused on these two systems, the underlying mechanisms—improved glycemic control, reduced oxidative stress, and anti-inflammatory effects—may potentially extend protection to other organ systems commonly affected in diabetes, such as the cardiovascular, retinal, and nervous systems. Further research exploring these potential benefits across additional organ systems would provide valuable insights into porang's comprehensive protective profile against diabetic complications.

Metabolic effects beyond glucose control

Lipid metabolism modulation

Dysregulated lipid metabolism, a common comorbidity in diabetes, significantly contributes to cardiovascular risk. Clinical studies demonstrate porang's favorable impact on cholesterol profiles. In one trial, diabetes patients consuming porang-processed rice showed significantly reduced LDL levels compared to those consuming regular white rice ($p = 0.021$). While HDL levels remained unchanged ($p = 0.102$), both LDL and HDL exhibited significant pre-post intervention variations ($p = 0.002$ and $p = 0.001$, respectively) [12]. These findings suggest porang may improve cardiovascular risk profiles in diabetic individuals.

Animal studies corroborate these effects. In a metabolic syndrome model using HFHF-fed rats, porang glucomannan-enriched synbiotic kefir prevented free fatty acid accumulation and reduced HbA1c levels [11], demonstrating porang's potential to address multiple aspects of dyslipidemia.

Anti-inflammatory effects

Chronic low-grade inflammation constitutes a key pathological component of diabetes and its complications. Investigations into porang's anti-inflammatory properties have revealed notable effects on inflammatory markers. In rats fed HFHF diets, synbiotic kefir containing porang glucomannan significantly reduced tumor necrosis factor-alpha (TNF-α) levels, a pro-inflammatory cytokine implicated in insulin resistance and diabetes progression. This anti-inflammatory effect was accompanied by decreased expression of the peroxisome proliferator-activated receptor gamma (PPARγ2) gene, suggesting modulation of adipose tissue metabolism and inflammatory responses [11]. While some studies have reported variable results regarding direct effects on C-reactive protein (CRP), significant reductions in MDA levels—a marker of oxidative stress closely linked to inflammation—have been observed in diabetic models treated with porang extract [10]. These findings collectively suggest that porang may help mitigate the inflammatory component of diabetes pathophysiology.

Gut health improvement

Emerging evidence highlights porang's prebiotic potential in modulating gut microbiota and their metabolic byproducts. A key study examined the impact of porang glucomannan on short-chain fatty acid (SCFA) production in HFHF-diet rats. Administration of glucomannan at varying doses (25, 50, and 100 mg per 200g body weight) increased SCFA levels, with the optimal effect observed at the 50 mg/200g body weight dosage. This intervention group demonstrated significantly higher SCFA levels (3.98±0.83 nmol/ml) compared to both normal controls (1.56±0.24 nmol/ml) and negative controls receiving only the high-fat, high-fructose diet (2.18±0.45 nmol/ml) [13]. As SCFAs are known to enhance gut barrier function, regulate glucose metabolism, and reduce systemic inflammation, these findings indicate that porang's metabolic benefits may be mediated through gut microbiome modulation.

Porang-derived glucomannan likely supports gut health through its prebiotic effects. As a fermentable fiber, it resists digestion in the upper gastrointestinal tract and is fermented by colonic bacteria, promoting the growth of beneficial microbes. This activity may explain the increased production of short-chain fatty acids (SCFAs) observed after porang administration [13]. By improving gut microbiota composition, porang may indirectly affect key metabolic pathways in diabetes, including inflammation, energy metabolism, and glucose regulation.

In summary, porang exerts multiple beneficial effects beyond glucose control, including improvements in lipid profiles, reduction of inflammatory markers, and improvement of gut health through increased SCFA production. These diverse metabolic actions position porang as a potential comprehensive intervention for addressing the multifaceted nature of diabetes and associated metabolic disorders. When combined with probiotics, the observed synergistic effects further suggest opportunities for developing optimized therapeutic approaches that leverage porang's broad spectrum of metabolic benefits.

Conclusion

This review highlights *porang* as a promising natural intervention for diabetes management, with robust evidence supporting its therapeutic potential. Rich in glucomannan, porang modulates key aspects of diabetes pathophysiology, including insulin gene expression, signaling pathways, pancreatic β-cell function and survival, glucose absorption, and oxidative stress and inflammation. Experimental studies demonstrate significant glucose-lowering effects comparable to pharmaceutical agents, alongside additional benefits such as prevention of diabetic complications and improvements in metabolic parameters, including lipid profiles and gut microbiota. However, challenges persist in standardizing extraction methods, optimizing formulations, and translating preclinical findings into clinical practice. Future research should prioritize well-designed human trials using standardized preparations and investigate potential synergies with other therapies. Given the rising global prevalence of diabetes—particularly in regions with limited access to conventional treatments—porang represents a compelling, evidence-based option that bridges traditional knowledge and modern scientific validation.

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Declaration of interest

The authors declare that there is no conflict of interest regarding the publication of this article.

Author contribution

NKFMJ was responsible for the conceptualization, literature search, and manuscript writing; NWN was responsible for the literature analysis, manuscript editing, and review; NKTW was responsible for the literature analysis, manuscript editing, and review.

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