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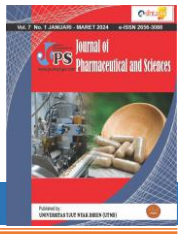

Therapeutic Potential of Purslane (*Portulaca oleracea* L.) Extract in Diabetes Type-2 Management: A Literature Review

Potensi Terapeutik Ekstrak Purslane (*Portulaca oleracea* L.) dalam Pengelolaan Diabetes Tipe-2: Tinjauan Literatur

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Abstract

Type 2 diabetes mellitus (T2DM) is a chronic metabolic disease characterised by insulin resistance, aberrant insulin secretion, and persistent hyperglycemia. There are different treatments existing but there is a need for complementary. *Portulaca oleracea* L. (purslane) medicinal herb with bioactive substance having antidiabetic property. The purpose of this study was to aimed *Portulaca oleracea* L. therapeutic potential, bioactive components, and underlying processes in the treatment of type 2 diabetes. The literature review was developed through a comprehensive examination of published journal articles retrieved from major academic databases, including Google Scholar, NCBI, PubMed, and ScienceDirec. Many studies have demonstrated that Portulaca oleracea L. possesses significant antidiabetic effect. These seem to result from insulin-sensitizing,a generalized, suppression of NF-κB-related inflammation, AMPK pathway stimulation/activation of eNOS expression in general, gut bacteria regulation effects, and carbohydrate digesting inhibition; whether by glycemic index level processes use/alleviation of those responses as an energy expenditure process. The dose effective in animal studies is between 50 and 500 mg/kg/day. Immediate clinical trials (1.0–1.8 g/day) demonstrate powerful improvements of fasting glucose, HbA1c lipid metabolism, and oxidative stress marker. *Portulaca oleracea* L. showed promise as an additional treatment for type 2 diabetes. Its bioactive components work in concert to address a variety of pathogenic targets. To validate the best therapeutic use, standardized extraction procedures and extensive clinical dose-finding studies are required.

***Keywords*: Purslane, Portulaca oleracea L, Herbal medicine, Therapy, Diabetes Type-2**

Abstrak

Diabetes melitus tipe 2 (T2DM) adalah penyakit metabolik kronis yang ditandai dengan resistensi insulin, sekresi insulin abnormal, dan hiperglikemia persisten. Terdapat berbagai pengobatan yang ada, tetapi dibutuhkan pengobatan komplementer. Portulaca oleracea L. (purslane) adalah tanaman obat dengan zat bioaktif yang memiliki sifat antidiabetik. Tujuan penelitian ini adalah untuk meneliti potensi terapeutik Portulaca oleracea L., komponen bioaktif, dan proses yang mendasarinya dalam pengobatan diabetes tipe 2. Tinjauan literatur dikembangkan melalui pemeriksaan komprehensif artikel jurnal yang diterbitkan yang diambil dari basis data akademik utama, termasuk Google Scholar, NCBI, PubMed, dan ScienceDirect. Banyak penelitian telah menunjukkan bahwa Portulaca oleracea L. memiliki efek antidiabetik yang signifikan. Hal ini tampaknya dihasilkan dari sensitivitas insulin, penekanan inflamasi terkait NF-κB secara umum pada sel atau jaringan parafisis, stimulasi/aktivasi jalur AMPK dari ekspresi eNOS secara umum, efek pengaturan bakteri usus, dan penghambatan pencernaan karbohidrat; Baik melalui proses tingkat indeks glikemik, penggunaan/pengurangan respons tersebut sebagai proses pengeluaran energi. Dosis efektif dalam studi hewan berkisar antara 50 hingga 500 mg/kg/hari. Uji klinis langsung (1,0–1,8 g/hari) menunjukkan peningkatan yang signifikan pada glukosa puasa, metabolisme lipid HbA1c, dan penanda stres oksidatif. Portulaca oleracea L. menunjukkan potensi sebagai pengobatan tambahan untuk diabetes tipe 2. Komponen bioaktifnya bekerja bersama untuk mengatasi berbagai target patogenik. Untuk memvalidasi penggunaan terapeutik terbaik, diperlukan prosedur ekstraksi standar dan studi penentuan dosis klinis yang ekstensif.

Kata Kunci: Purslane, Portulaca oleracea L, Obat herbal, Terapi, Diabetes Tipe-2.

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Introduction

Type 2 diabetes mellitus (T2DM) represents a major global health concern, with more than 400 million individuals affected worldwide. The World Health Organization (WHO) defines diabetes as a chronic disease marked by sustained high blood glucose levels that, over time, may result in damage to vital organs and tissues, particularly the heart, retina, kidneys, and peripheral nervous system. T2DM is responsible for >90% of diabetes cases and is characterized as a entity with insulin resistance and progressive β-cell dysfunction, driving processes including β-cell dedifferentiation, mitochondrial impairment, and increased oxidative stress [1,2] There is a failure of insulin release which leads to the condition of chronic hyperglycemia. Type 2 diabetes mellitus patients are generally obese or have increased body fat. This fat accumulation is normally in the abdominal area [3].

Complementary and alternative medicine, especially herbal medicine (HM) has received much attention in the management of chronic diseases over the past decades. Herbal preparations have been widely utilized across diverse cultural contexts including Japan, China, Canada, New Zealand, the United States, and Russia owing to their therapeutic potential and longstanding traditional acceptance [4]. Herbal medicines have long been employed in traditional medical systems for the treatment of diverse diseases [5], and contemporary experimental studies increasingly showed its therapeutic potential, demonstrating antiviral, anthelmintic, antiallergic, anti-inflammatory, antioxidant, anticancer, antidiabetic, antibacterial, and antimalarial activities [6]. Medicinal plants contain a wide range of secondary metabolites which can be categorized thus on the basis. Flavonoids, alkaloids, terpenes phenolics, tannins, saponins, gylcosides and essential oils are bioactive compounds that underlie the pharmacological efficacy of herbal therapeutics [7]. A vast number of medicinal plants have shown significant hypoglycemic activity and are gaining attention as adjuncts to standard antidiabetics for diabetes management [8].

Portulaca L. *Portulacaceae Juss.* is the only living genus in a large family of flowering plants, other than Chenopodiaceae. Species in the genus are cosmopolitan, occurring throughout much of the world but most common in tropical and subtropical climates, with centers of diversity mainly in South America and Africa. Portulaca L. the only extant genus in the family *Portulacaceae Juss*. The studies do show that purslane is among the most abundant land source of ascorbic acid, tocopherols, glutathione and beta-carotene. It indicates its potential as a healthy food. Furthermore, purslane is also a source of specialized metabolites like flavonoids, alkaloids, terpenoids, catecholamines, phenolic acids, anthocyanins and lignans, and betalains, all of which markedly enhance its pharmacological potential [9,10]. The pharmacological potential of purslane has been extensively investigated through both in vitro and in vivo studies, yielding compelling evidence of its efficacy as a medicinal plant.

Methods

A systematic literature review was conducted to evaluate the therapeutic potential of Portulaca oleracea L. in the management of type 2 diabetes mellitus (T2DM). Literature searches were performed using multiple electronic databases, including PubMed, Scopus, ScienceDirect, Google Scholar, and SpringerLink. The search strategy utilized combinations of Medical Subject Headings (MeSH) terms and keywords as follows: *Portulaca oleracea*, purslane, type 2 diabetes mellitus, T2DM, and antidiabetic. The article selection process followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and consisted of

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four sequential stages: identification, screening, eligibility assessment, and final inclusion. Duplicate records were removed during the screening process, followed by title and abstract evaluation to determine relevance. Full-text articles were subsequently assessed for eligibility. The inclusion criteria comprised original research articles involving in vitro, in vivo, and clinical studies investigating the antidiabetic effects of P. oleracea, published between 2010 and 2026. Articles not available in full text, review papers, conference abstracts, editorials, and studies unrelated to diabetes management were excluded from the analysis.

PRISMA Flow diagram of the literature search and study selection process

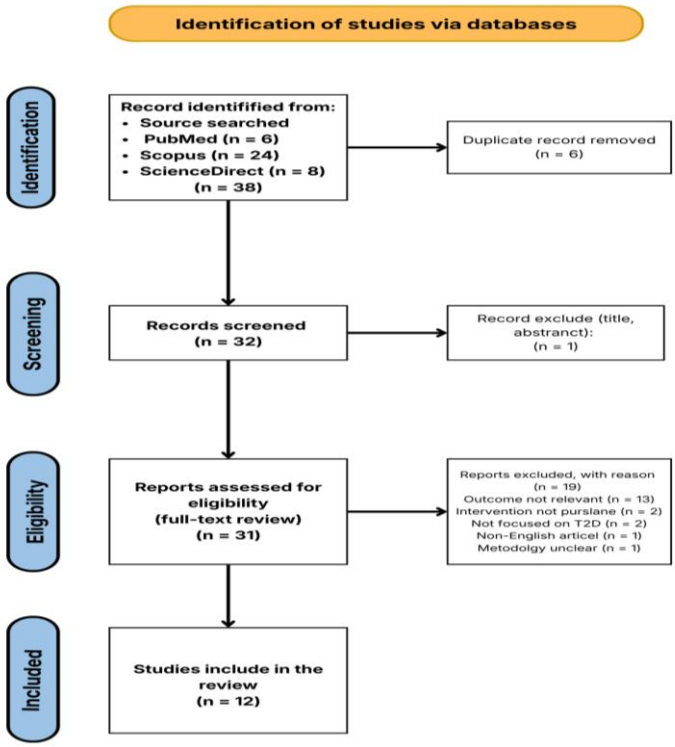

Figure 1. PRISMA flow diagram of the study selection process.

Result and Discussion

Numerous molecular pathways supporting blood glucose regulation have been shown by research on Portulaca oleracea L. (purslane) as an antidiabetic medication. The following table 1, which lists the primary bioactive compounds, the plant parts used, and the procedures involved, summarizes the findings of several studies. These processes include controlling the metabolism of branched-chain amino acids and gut flora, as well as improving insulin sensitivity by inhibiting PTP1B. A thorough summary of purslane's potential as an auxiliary therapy candidate in diabetes control is also provided by the table, which shows the dosages employed in animal models and the outcomes attained.

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Tabel 1. Summary of research on bioactive compounds in Purslane and their potential mechanisms as an antidiabetic therapy

Journal Title	Author	Compound	Plant Part Used	Extraction Solvent	Mechanism	Dose Used	Limitation	Result
"Anti-Diabetic Effect of *Portulaca oleracea* L. Polysaccharideandits Mechanism in Diabetic Rats"	(Bai et al., 2016) [11]	Polysaccharide	Whole plant	Ethanol 95% extract	Enhances insulin sensitivity through PTP1B inhibition and reduces inflammatory cytokines	200 & 400 mg/kg/day (rats) → 2.2–4.5 g/day (HED)	Used a crude polysaccharide fraction. Specific active monosaccharide or standardized marker compound was not reported. Animal model only.	Improved glucose tolerance and insulin resistance
"*Portulaca oleracea* L. alleviates liver injury in streptozotocin-induced diabetic mice"	(Zheng et al., 2017) [12]	compound was not clearly reported	Whole plant	Ethanol extract	Modulates gut microbiota and promotes BCAA catabolism	1 g/kg/day (mice) → 5.7 g/day (HED)	Used crude ethanol extract. No active compound quantification. STZ-induced mouse model and short treatment duration limit clinical translation.	Purslane exerts antidiabetic effects through its hypoglycemic and hypolipidemic properties, while simultaneously attenuating both systemic and hepatic inflammation via inhibition of the Rho–NFκB signaling pathway.
"Portulaca oleracea L. Extract Alleviated Type 2 Diabetes Via Modulating the Gut Microbiota and Serum Branched-Chain Amino Acid Metabolism"	(Bao et al., 2022) [13]	Alkaloids	Whole plant	Extraction solvent is not stated.	Reduced blood glucose and improved insulin sensitivity	300mg/kg/day (mice) → 1.7 g/day (HED)	Mechanism was linked to gut microbiota and BCAA metabolism. Active compounds were not individually tested for causality. Mouse model only.	Reduced blood glucose and improved insulin sensitivity
"Effects of *Portulaca oleracea* L. seeds in treatment of type-2 diabetes mellitus	(El-Sayed, 2011) [14]	Polysaccharide, include tannins and flavonoids	Seeds	No extraction solvent	Improves insulin action and glucose metabolism	100mg/day Human clinical dose	Small clinical sample, n = 30. Seed powder was not standardized to active marker compounds. The	Decreased fasting and postprandial blood glucose levels.

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patients as adjunctive and alternative therapy"							dose should be corrected to **5 g twice daily**, not 100 mg/day.	
"*Portulaca oleracea* L. (Purslane) Extract Protects Endothelial Function by Reducing Endoplasmic Reticulum Stress and Oxidative Stress through AMPK Activation in Diabetic Obese Mice"	(Miao et al., 2023) [15]	Polyphenols, Cryptochloro-genicacid, luteolin8-C-glucoside, quercetin3-galactoside, luteolin, quercetin, and kaempferol. Kaempferol-3-O-glucoside and luteolin-7-O-glucoside	Leaf	Water : Ethanol extract 1:1	Activates AMPK/eNOS signaling and suppresses oxidative stress	200 mg/kg/day (mice) → 1.1 g/day (HED)	Conducted in diabetic obese mice. No human clinical dose validation. Long-term safety and standardized therapeutic dose remain unclear.	Improved endothelial function and metabolic status
"The effect of portulaca oleracea alkaloids on antidiabetic properties through changes in ceramide metabolism"	(Roozi et al., 2021) [16]	Isoquinoline alkaloids, especially oleracein E and oleracein L	Whole plant	Extraction solvent is not stated.	Stimulates insulin secretion and glucose uptake	50 & 100 mg/kg/day (rats) → 0.5–1.1 g/day (HED)	Mechanistic evidence focuses on alkaloid-related pathways. Clinical relevance remains limited because human dose and safety were not validated.	Increased insulin release and cellular glucose utilization
"Comparative study on the effects of *Portulaca oleracea* extract and a commercial dietary supplement in spontaneously hypertensive rats with induced type 2 diabetes"	(Daneva et al., 2026) [17]	Oleracein, Phenolic acid, Flavonoid, Antioxsidants Lipohilic & Vitamin	Leaf & Stem	Ethanol extract	Enhances GLUT-4 translocation and insulin receptor sensitivity	300 mg/kg/day (rats) → 3.4 g/day (HED)	Animal model only. Comparative design with a commercial supplement needs clinical confirmation. Specific contribution of each compound remains unclear.	Improved glucose tolerance and antioxidant status
"Effect of Hydroalcoholic extract of Purslane (*Portulaca Oleracea* L.) on Diabetic Variables in D-Galactose	(Ahangarpour, 2018) [18]	Catecholamines, phenolic acids, flavonoids, caffeic acid, ferulic acid and luteolin	Leaf	Hydroalcoholic extract	Reduces oxidative stress and protects pancreatic β-cel	100 & 200 mg/kg/day (mice) → 0.6–1.1 g/day (HED)	Used crude hydroalcoholic extract. No isolated compound testing. Conducted in a D-galactose-induced aging mouse model, so	Improved insulin resistance and pancreatic morphology

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Induced Aging Mouse Model"							the model does not fully represent human T2DM.	
"*Portulaca oleracea* (purslane) aqueous extract reduced the adverse metabolic outcomes and favored liraglutide activities in streptozotocin-induced cardiometabolic disorders of male Wistar rats"	(Oyabambi et al., 2024) [19]	Flavonoid dan polifenol specific compounds not quantified	Leaf	Ethanolic extract	Exhibits GLP-1R agonist-like activity and activates AMPK	250 mg/kg/day (mice) → 2.8 g/day (HED)	Rat model only. Small animal sample. The dose should be checked because the source reports 400 mg/kg, while the current table lists 250 mg/kg.	Enhanced β-cell function and insulin secretion
"Positive Influence of Portulaca oleracea L. in Rats With Type 2 Diabetes Mellitus"	(Mohammed et al., 2020) [20]	Phenolic compounds, Saponins, Alkaloids, Glycosides, Resins, Tannins, Proteins and Flavonoids	Whole plant	Extraction solvent is not stated.	Increases antioxidant enzyme activity (SOD, CAT)	250 mg/kg/day (mice) → 2.8 g/day (HED)	Broad phytochemical screening only. No quantification of active compounds. Animal model only.	Reduced oxidative stress and blood glucose levels.
"Enhancing antidiabetic bioactivity of purslane leaf extract (Portulaca oleracea L.) through synthesis of nanoemulsion: In vitro and in vivo evidence"	(Budaya et al., 2025) [21]	Quercetin	Leaf	Extraction solvent is not stated.	Inhibits α-amylase and reduces oxidative stress	50 & 100 mg/kg (rats) → 0.5–1.1 g/day (HED)	In vitro α-amylase inhibition and alloxan-induced animal model. Nanoemulsion stability and clinical applicability require further validation.	Improved glycemic control and antidiabetic activity
"Purslane Extract and Glucose Homeostasis in Adults with Type 2 Diabetes: A Double-Blind, Placebo-Controlled Clinical Trial of Efficacy and Safety "	(Wainstein et al., 2016) [22]	compound was not clearly reported	Leaf & Stem	Extraction solvent is not stated.	Activates PPARγ and improves insulin sensitivity.	180mg/day Human clinical dose	Small clinical trial, n = 63, 12 weeks. HbA1c improvement was mainly reported in a responder subgroup. No compound-level standardization was presented.	Reduced HbA1c and systolic blood pressure

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Critical Synthesis of Mechanistic Evidence

The antidiabetic activity of *Portulaca oleracea* L. appears to involve multiple biological pathways rather than a single dominant mechanism. However, the strength of evidence differs across mechanisms, plant parts, extract types, and experimental models. Studies using polysaccharide fractions, mainly support the role of purslane polysaccharides in improving insulin sensitivity through inhibition of protein tyrosine phosphatase 1B, PTP1B [11]. This mechanism is relevant because PTP1B negatively regulates insulin receptor signaling. Inhibition of PTP1B may therefore enhance insulin receptor activity and improve glucose uptake. Nevertheless, the study used an animal model and a crude polysaccharide fraction. The exact monosaccharide profile, molecular weight distribution, and active structural unit responsible for PTP1B inhibition were not fully standardized. This limits compound-level interpretation.

The AMPK-related mechanism is more strongly linked to phenolic and flavonoid-rich fractions. Reported that *Portulaca oleracea* extract improved endothelial function through AMPK/eNOS activation and reduction of oxidative stress [15]. The compound profile in this study included cryptochlorogenic acid, luteolin-8-C-glucoside, quercetin-3-galactoside, luteolin, quercetin, kaempferol, kaempferol-3-O-glucoside, and luteolin-7-O-glucoside. These compounds provide a clearer biochemical basis for the observed effect than studies that only report broad phytochemical classes. The findings suggest that polyphenols may contribute to metabolic improvement by reducing oxidative stress and restoring endothelial signaling. However, the evidence remains preclinical. The study did not test each isolated compound separately. Therefore, the observed AMPK/eNOS effect should be interpreted as the effect of a polyphenol-rich extract rather than the effect of one confirmed active compound.

The GLP-1-related mechanism provides another important pathway, but the evidence remains preliminary. Ethanolic extract of *Portulaca oleracea* showed GLP-1 receptor agonist-like activity and enhanced AMPK activity in streptozotocin-induced diabetic male Wistar rats [19]. The study also compared purslane extract with liraglutide, a known GLP-1 receptor agonist. The result suggests that purslane extract may support glucoregulation through pathways that overlap with liraglutide activity. However, this does not mean that purslane acts as a direct pharmacological substitute for liraglutide. Liraglutide is a standardized peptide drug with defined receptor activity, while purslane extract contains a complex mixture of flavonoids, polyphenols, and other secondary metabolites. The GLP-1 receptor agonist-like effect may result from indirect metabolic regulation, antioxidant activity, improvement of pancreatic beta-cell function, or modulation of inflammatory pathways. Further receptor-binding studies, dose-response experiments, and compound isolation are needed to confirm whether specific flavonoids or polyphenols directly activate GLP-1 receptor signaling.

Alkaloid-related effects also require careful interpretation. Linked purslane alkaloids with improved insulin secretion and glucose uptake through changes in ceramide metabolism (Roozi et al., 2021). This suggests a possible connection between purslane alkaloids, lipid signaling, and insulin responsiveness. Oleracein-type alkaloids may be relevant candidates for further mechanistic investigation. However, clinical evidence for alkaloid-specific antidiabetic activity is still absent. Future studies should test isolated alkaloids, quantify their bioavailability, and evaluate their safety at therapeutic doses.

Clinical evidence is still limited. Compared purslane seed powder with metformin in 30 patients with type 2 diabetes and reported improvements in fasting glucose, postprandial glucose, lipid profile, insulin resistance, and body weight [14]. The study used 5 g of purslane seeds twice daily. This result is promising because it involved human participants and used metformin as a comparator. However, the sample size was small, the intervention duration was short, and the seed powder was not standardized to a defined active marker compound. Therefore, the findings support purslane as a possible adjunct therapy, but they do not establish it as an evidence-based replacement for conventional antidiabetic medication. Overall studies that identified specific compounds or chemical profiles provide stronger mechanistic value than studies that only used crude extract or broad phytochemical classes. The strongest mechanistic links can be summarized as follows: polysaccharides may support PTP1B inhibition and insulin sensitivity; polyphenols such as cryptochlorogenic acid, luteolin derivatives, quercetin derivatives, and kaempferol derivatives may support AMPK/eNOS activation and antioxidant protection; flavonoid and polyphenol-rich extracts may contribute to GLP-1-related glucoregulation; and alkaloids may influence insulin secretion and ceramide-related metabolic pathways. However, most studies still do not prove direct causality between a single compound and a specific molecular target.

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Limitations of Current Evidence

Several limitations should be considered when interpreting the antidiabetic potential of *Portulaca oleracea* L. First, extract standardization remains a major issue. The reviewed studies used different plant parts, including whole plant, leaves, stems, and seeds, as well as different preparations such as aqueous extract, hydroalcoholic extract, ethanolic extract, seed powder, polysaccharide fraction, alkaloid fraction, and nanoemulsion. These variations may affect the concentration of flavonoids, alkaloids, polysaccharides, phenolic acids, omega-3 fatty acids, and other active compounds. Therefore, direct comparison across studies remains difficult without standardized extraction methods and marker compound quantification. Most preclinical studies had short intervention periods, generally only a few weeks. These studies can show early changes in glucose control, insulin sensitivity, oxidative stress, and inflammation. However, they cannot confirm long-term efficacy, prevention of diabetic complications, or delayed toxic effects. Since type 2 diabetes is a chronic disease, future studies should include longer follow-up, toxicity evaluation, and monitoring of liver and kidney function. Clinical evidence remains limited. Existing human studies suggest that purslane may improve glycemic parameters and lipid metabolism, but the sample sizes are still small. For example, El-Sayed [14] included only 30 patients with type 2 diabetes [14], while Wainstein et al. [22] reported HbA1c improvement mainly in a responder subgroup. Larger randomized controlled trials with longer duration and stronger statistical power are needed.

Pharmacokinetic and pharmacodynamic interactions between purslane extract and conventional antidiabetic drugs remain unclear. This is important because patients may use purslane together with metformin, sulfonylureas, insulin, DPP-4 inhibitors, SGLT2 inhibitors, or GLP-1 receptor agonists. Additive glucose-lowering effects may increase the risk of hypoglycemia, especially when combined with insulin or sulfonylureas. Specific interaction studies are therefore required. The long-term safety and toxicity profile of purslane extract has not been fully established. Although human studies generally suggest good tolerability, high-dose animal studies indicate possible hepatic and renal toxicity. Oxalates and nitrates may also contribute to safety concerns. Future clinical trials should monitor liver enzymes, kidney function, electrolytes, hypoglycemic events, gastrointestinal symptoms, and possible herb-drug interactions. Most studies do not compare the relative contribution of specific bioactive compounds. Studies often report broad groups such as flavonoids, polyphenols, or alkaloids without isolating and testing each compound against specific molecular targets. Further research should combine phytochemical profiling, molecular docking, in vitro validation, animal studies, and clinical trials to clarify whether compounds such as quercetin, luteolin, kaempferol, cryptochlorogenic acid, oleracein-type alkaloids, or polysaccharide fractions are the main contributors to antidiabetic activity.

Dose translation and clinical relevance

Dose interpretation is essential for translating the antidiabetic activity of *Portulaca oleracea* L. from animal studies to clinical use. Because preclinical studies used different species, plant parts, extracts, and formulations, direct comparison between animal mg/kg doses and human gram-per-day doses may be misleading. Therefore, body surface area based allometric conversion was applied using Km values of 6 for rats, 3 for mice, and 37 for adult humans. Using this method, a rat dose of 200 mg/kg/day is equal to about 32.4 mg/kg/day in humans, or approximately 2.27 g/day for a 70 kg adult. A rat dose of 400 mg/kg/day equals about 4.54 g/day. In mice, 200 to 300 mg/kg/day corresponds to approximately 1.14 to 1.70 g/day in humans. These values show that the clinical dose range of 1.0 to 1.8 g/day overlaps with several lower and moderate preclinical doses. However, it remains lower than the predicted human equivalent dose for several effective rat doses, such as 200 to 400 mg/kg/day, which correspond to approximately 2.27 to 4.54 g/day. These findings indicate that the clinical dose of 1.0 to 1.8 g/day is biologically plausible but cannot yet be considered optimal. It may represent a conservative dose selected to support tolerability and safety, especially because purslane is proposed as an adjunctive therapy. However, the dose may still be below the effective range suggested by some crude extract studies. This supports the need for standardized extracts and dose-finding clinical trials. Future studies should also evaluate long-term safety, hepatic and renal markers, and possible interactions with antidiabetic drugs such as metformin, sulfonylureas, GLP-1 receptor agonists, and insulin.

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Conclusions

This review demonstrates that Portulaca oleracea L. exhibits potential as an adjunctive therapeutic agent in the management of type 2 diabetes mellitus (T2DM) through multiple pharmacological mechanisms, including improvement of insulin sensitivity, reduction of oxidative stress and inflammatory responses, modulation of glucose metabolism, and preservation of pancreatic β-cell function. These effects are associated with the synergistic actions of its bioactive constituents, including polysaccharides, flavonoids, alkaloids, phenolic compounds, and omega-3 fatty acids. However, the current clinical evidence remains limited and should be interpreted cautiously. Existing human studies are restricted to a small number of clinical trials with limited sample sizes and relatively short intervention periods. In addition, substantial heterogeneity in extraction methods, phytochemical composition, and dosing strategies across studies limits direct comparison and reduces the reproducibility of findings. No studies have specifically investigated the pharmacokinetic interactions between P. oleracea extracts and conventional antidiabetic therapies. Therefore, the concurrent use of purslane with standard antidiabetic medications cannot currently be considered fully established in terms of efficacy or safety. Based on the currently available evidence, routine clinical use of Portulaca oleracea extract cannot yet be recommended, and no validated therapeutic dosage has been established for standard clinical practice. Future research should prioritize large-scale randomized placebo-controlled clinical trials with longer treatment durations and dose-escalation designs to determine optimal dosage, evaluate long-term safety, and clarify potential herb–drug interactions in patients with T2DM.

Conflict of Interest

The authors declare the absence of any conflicts of interest.

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References

[1] Ruze R, Liu T, Zou X, Song J, Chen Y, Xu R, et al. Obesity and type 2 diabetes mellitus: connections in epidemiology, pathogenesis, and treatments. Front Endocrinol (Lausanne) 2023;14:1161521.

[2] Galicia-Garcia U, Benito-Vicente A, Jebari S, Larrea-Sebal A, Siddiqi H, Uribe KB, et al. Pathophysiology of type 2 diabetes mellitus. Int J Mol Sci 2020;21:6275.

[3] Galicia-Garcia U, Jebari S, Larrea-Sebal A, Uribe KB, Siddiqi H, Ostolaza H, et al. Statin treatment-induced development of type 2 diabetes: from clinical evidence to mechanistic insights. Int J Mol Sci 2020;21:4725.

[4] Forni C, Facchiano F, Bartoli M, Pieretti S, Facchiano A, D'Arcangelo D, et al. Beneficial role of phytochemicals on oxidative stress and age-related diseases. Biomed Res Int 2019;2019:8748253.

[5] Chahrour JA, Abdel Baki Z, El Badan D, Nasser G, Maresca M, Hijazi A. Herbal Medicines in the Management of Diabetes Mellitus: Plants, Bioactive Compounds, and Mechanisms of Action. Biomolecules 2025;15:1674.

[6] Mahmoud AD, Al-Rawi SS, Hama HA. Traditional uses, bioactive compounds and pharmacological uses of Vitex doniana Sweet: a review. Ethnobot Res Appl 2025;30:1–130.

[7] Latif R, Nawaz T. Medicinal plants and human health: A comprehensive review of bioactive compounds, therapeutic effects, and applications. Phytochem Rev 2025:1–44.

[8] Alam S, Sarker MMR, Sultana TN, Chowdhury MNR, Rashid MA, Chaity NI, et al. Antidiabetic phytochemicals from medicinal plants: prospective candidates for new drug discovery and development. Front Endocrinol (Lausanne) 2022;13:800714.

[9] Gu Y, Ying Z, Lan X, Ying X, Yang G. Two new esters from the aerial parts of Portulaca oleracea L. and

Electronic ISSN : 2656-3088
Homepage: https://www.journal-jps.com

their bioactivities. Phytochem Lett 2021;44:98–101.
[10] Guo J, Peng J, Han J, Wang K, Si R, Shan H, et al. Extracts of Portulaca oleracea promote wound healing by enhancing angiology regeneration and inhibiting iron accumulation in mice. Chinese Herb Med 2022;14:263–72.
[11] Bai Y, Zang X, Ma J, Xu G. Anti-diabetic effect of Portulaca oleracea L. Polysaccharideandits mechanism in diabetic rats. Int J Mol Sci 2016;17:1201.
[12] Zheng G, Mo F, Ling C, Peng H, Gu W, Li M, et al. Portulaca oleracea L. alleviates liver injury in streptozotocin-induced diabetic mice. Drug Des Devel Ther 2017:47–55.
[13] Bao M, Hou K, Xin C, Zeng D, Cheng C, Zhao H, et al. Portulaca oleracea L. extract alleviated type 2 diabetes via modulating the gut microbiota and serum branched-chain amino acid metabolism. Mol Nutr Food Res 2022;66:2101030.
[14] El-Sayed M-IK. Effects of Portulaca oleracea L. seeds in treatment of type-2 diabetes mellitus patients as adjunctive and alternative therapy. J Ethnopharmacol 2011;137:643–51.
[15] Miao L, Zhou C, Zhang H, Cheong MS, Tan Y, Wang Y, et al. Portulaca oleracea L.(purslane) extract protects endothelial function by reducing endoplasmic reticulum stress and oxidative stress through AMPK activation in diabetic obese mice. Antioxidants 2023;12:2132.
[16] Roozi H, Akbar Boojar MM, Eidi A, Khavari-Nejad R. The effect of portulaca oleracea alkaloids on antidiabetic properties through changes in ceramide metabolism. Egypt J Basic Appl Sci 2021;8:156–66.
[17] Daneva Y, Zheleva-Dimitrova D, Simeonova R. Comparative study on the effects of Portulaca oleracea extract and a commercial dietary supplement in spontaneously hypertensive rats with induced type 2 diabetes. Pharmacia 2026;73:1–10.
[18] Ahangarpour A, Oroojan AA, Khorsandi L, Lamoochi Z. Effect of hydroalcoholic extract of purslane (Portulaca oleracea L.) on diabetic variables in D-galactose induced aging mouse model. Acta Endocrinol 2018;14:24.
[19] Oyabambi AO, Aindero BB, Awolola AM, Adebayo AY, Iluromi IB, Olorunniyi KS. Portulaca oleracea (purslane) aqueous extract reduced the adverse metabolic outcomes and favored liraglutide activities in streptozotocin-induced cardiometabolic disorders of male Wistar rats. Endocr Metab Sci 2024;16:100191.
[20] Mohammed MT. Positive influence of Portulaca Oleracea L. in rats with type 2 diabetes mellitus 2020.
[21] Budaya AT, Kaharuddin PR, Said AA, Jannah SN, Nicola N, Bahrun B, et al. Enhancing antidiabetic bioactivity of purslane leaf extract (Portulaca oleracea L.) through synthesis of nanoemulsion: In vitro and in vivo evidence. J Res Pharm 2025;29:1007–16.
[22] Wainstein J, Landau Z, Dayan YB, Jakubowicz D, Grothe T, Perrinjaquet-Moccetti T, et al. Purslane extract and glucose homeostasis in adults with type 2 diabetes: A double-blind, placebo-controlled clinical trial of efficacy and safety. J Med Food 2016;19:133–40.

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