NUTRACEUTICAL FORMULATION OF HYPOGLYCEMIC TABLETS BY USING NATURAL INGRIDENTS

Apurva K. Kapse*, Rishabh Nimje, Jitendra Shivankar, Tulsidas Nimbekar

Corresponding Author: Apurva K. Kapse

Shri Laxmanrao Mankar Institute of Pharmacy, Amgaon-441902 Dist. Gondia

ABSTRACT

The rising incidence of diabetes mellitus underscores the importance of incorporating plant-derived nutraceuticals alongside conventional drugs to mitigate side effects. This study evaluates the efficacy of the bark extract of Soymida febrifuga (Roxb.) A. Juss. and the leaf/fruit extract of Melia azedarach L. (synonymised as Melia Azedarach) as vital components of anti-diabetic tablets due to their flavonoids, terpenoids, and alkaloids. Methanolic bark extract of S. febrifuge (200 mg/kg) exhibited remarkable hypoglycaemic and Antihyperglycemic actions in normal and alloxan-induced diabetic rats, improving insulin sensitivity to the level of glibenclamide and protecting the liver.

Mema extract proved more effective than aqueous extract in stimulating insulin secretion, modulating lipid levels, and enhancing antioxidant activity, owing to its high flavonoid content. Synergy among polyherbs was employed to prepare herbal tablets using the wet granulation technique, resulting in optimal pharmaceutical properties (hardness of 3-5 kg/cm², friability of less than 1%, and disintegration time of less than 12 minutes). Results of tests conducted on ob/ob mice showed at least 25-40% improved performance compared to the control group.

KEYWORDS

Hypoglycaemic tablets, Nutraceutical preparation, Soymida febrifuga, Melia azedarach, Antidiabetic extracts, Flavonoids, Terpenoids, Alkaloids, Bark extract (methanol), Phenolic contents from fruit and leaf, Antihyperglycemic action, Insulin sensitivity.

INTRODUCTION

Soymida febrifuga (Roxb.) A. Juss. (Family: Meliaceae), known traditionally as "Rohini" due to its febrifuga and antidiabetic attributes in the Indian indigenous herbal medicine system, produces methanolic bark extracts containing significant amounts of Flavonoids (quercetin-type derivatives), Terpenes (limonoids), and tannins. Experimental evidence indicates effective Hypoglycaemic Effects in Alloxan-induced Diabetic Rats (at doses of 150-400 mg/kg per oral route of administration, 21-day treatment duration), resulting in significant reductions in glucose levels (from around 300 mg/dL to 120 mg/dL), total cholesterol, triglycerides, and normal serum protein levels relative to glibenclamide (10 mg/kg).

Likewise, Melia azedarach L. (Meliaceae; Synonym: Melia Azerdach), commonly known as Chinaberry or "Bakayan," is characterized by leaf/fruit extracts containing azadirachtin-type

limonoids, flavonoids (quercetin, kaempferol), and phenolic acids. (Meliaceae), regarded with utmost reverence in Indian traditional medicine as "Rohini" is used to treat febrile diseases and diabetes due to its flavonoids (derivatives of quercetin), terpenoids (limonoids), and tannins. The preclinical trials in diabetic rats induced by alloxan administration (150–400 mg/kg p.o.; 21 days) have revealed a significant reduction ($p<0.001$) in plasma glucose levels (300–120 mg/dL), in addition to a decrease in total cholesterol, triglyceride content, and normalisation of serum proteins compared with glibenclamide (10 mg/kg). The underlying mechanisms include pancreatic β-cell regeneration, an increase in insulin secretion, and liver protection through antioxidant activity. The tree Melia Azederach L. (Meliaceae; syn. Melia Azederach) or "Chinaberry" or "Bakayan" contains leaf and fruit extracts that contain azadirachtin-like limonoids, flavonoids (including quercetin and kaempferol), as well as phenolic compounds. The administration of lyophilized aqueous/methanolic extracts of Melia azedarach fruits to ob/ob mice and streptozotocin-induced diabetic rats (200–400 mg/kg IP) leads to a dose-dependent induction.

Advantages of Natural Compounds for Nutraceutical Formulation of Hypoglycaemic Tablet

Better Safety profile: Very low toxicity (LD50 >2000 mg/kg); no risk of hypoglycaemia, gastrointestinal irritation, or toxicity to organs; protects the liver from ROS-mediated β-cell damage.

Multitarget Antidiabetic Mechanism: Inhibit carbohydrate hydrolysing enzymes (α-glucosidase/amylase), increase insulin sensitivity (AMPK/GLUT4 activation), promote insulin secretion, β-cell regeneration, and delay stomach emptying (twice the retention rate of control drugs in diabetic rodents).

Equivalent Effectiveness to standard Antidiabetics: Bark of S. febrifuge (400 mg/kg) decreases glucose levels by ~60% in alloxan-induced diabetic rats; M. azedarach (200-400 mg/kg) significantly decreases fasting glucose levels by 30-50% in ob/ob mice comparable to glibenclamide.

Oxidant/cholesterol-lowering Properties: Flavonoids and terpenes regulate lipid levels, prevent oxidative stress, and maintain body balance.

Compatibility with pharmaceutical forms: Wet granulation method facilitates the formulation of stable tablets (friability <1%, disintegration time <15 minutes) using natural binders for improved absorption.

Applications of Natural Compounds for Nutraceutical Formulation of Hypoglycaemic Tablet

Blood glucose regulation: The extracts from these plants lower fasting blood glucose level along with that of postprandial blood glucose levels (reduction between 30-67% in ob/ob mice/alloxan rats treated with the extract at 200-400 mg/kg dose during 21 days), which is equivalent to glibenclamide.

Enhancement of insulin sensitivity: M. azedarach enhances peripheral glucose uptake, lowers plasma insulin level (reduction of 52-78%) and modulates insulin-responsive gene expression without acute peaks.

Gastric emptying regulation: M. azedarach extract (400 mg/kg) retards gastric emptying by 2-2.4-fold in SD/GK rats, reducing glucose fluctuations and promoting satiety.

Improvement of lipid profile: Methanolic extract of S. febrifuge normalized cholesterol/triglyceride serum and serum proteins in diabetic rats.

Protection from oxidative stress and β-cell protection: Antioxidants found in these extracts offer protection against oxidative stress and facilitate pancreatic regeneration.

Inhibition of inflammatory mediators: M. azedarach extract (with 71.95% RBC stabilisation rate at 100 µg/mL) decreases inflammation caused by diabetes mellitus.

Plant Profile

Soymida Febrífuga

The scientific name of Soymida febrifuga (Roxb.) A. Juss. is synonymous with Soymida febrifuga Roxb. It belongs to the mahogany family (Meliaceae). This species is an erect medium/large-sized deciduous/semi-evergreen tree indigenous to the Indian subcontinent and Sri Lanka. Soymida febrifuga, often nicknamed the “Indian Mahogany” or “Maharukh,” stands out in Ayurveda for its unique blend of bitter, astringent, and pungent qualities. In this article, you’ll discover botanical details that set it apart, its journey through ancient manuscripts, the bioactive compounds that make it tick, plus evidence-based health effects, safe dosing forms, and modern research updates. No generic fluff here—just straight talk on what Soymida febrifuga really does, how practitioners historically used its bark, seeds, leaves, and what new studies are revealing. Buckle up for a detailed ride into this fascinating tree.

Botanical Features

Growth and Dimensions: 20–30 m Height, 3-4 m Diameter; straight trunk with buttresses; greyish-brown bark having a bitter resinous taste.

Leaves: Alternate, par pinnately compound leaflet arrangement, with a size range of 15-40 cm. There are 8-11 pairs of opposite elliptic-oblong leaves (3-10 × 1.5-5 cm) that are smooth and leathery.

Flowers: Bisexual, greenish-white, and 5 mm in size, which grow in lax terminal panicles measuring 20-35 cm long; calyx (5-lobed) and 5 petals in the corolla.

Fruit and Seed Structure: Oblong woody capsule-like structures measuring 4-6 cm, having five chambers and a spongy central columella containing numerous small brown seeds with wings.

Microscopic Identification: Starch grains (simple/compound forms), prismatic Ca-oxalate crystals, lignified fibres, and pitted stone cells.

Natural Habitat and Geographic Spread

It is commonly found in moist deciduous forest regions, mixed deciduous forest areas, and at elevations below 1000 m. It grows frequently in Uttar Pradesh, Madhya Pradesh, Maharashtra, Bihar, Odisha, and Sri Lanka. The conservation status according to IUCN is Vulnerable due to over-exploitation.

Plant Chemical Components

Bark components include flavonoids (Quercetin and luteolin 7-O-glucoside), terpenoids/limonoids (gedunin, febrifuge, methyl anglesite, fibrines A/B, and oxyfedrine B), phenols, steroids, tannins, saponins, and alkaloids.

Heartwood/fruit components consist of lupeol, β-sitosterol, deoxyandrobin, myricetin, and carbonyl compounds.

Medicinal Use

Traditional Use



Fig: - Flower of Soymida Febrifuga



Fig: - Bark of Soymida Febrifuga

Vernacular Names of Soymida Febrifuga

Language	Vernacular Names
English	Indian Red Wood, Bastardo Cedar, Rohan tree
Hindi	Rakat Rohan, Ruhuna
Marathi	Potar
Sanskrit	Chandra Vallabha

Soymida febrifuga is a medium to large deciduous tree, reaching heights of 20–25 m. Its straight, cylindrical bole often bears pale grey, scaly bark that peels in small patches. Leaves are imparipinnate with 5–9 lanceolate leaflets (10–20 cm long), giving a feathery appearance. In spring, it produces small greenish-yellow flowers arranged in loose panicles. The fruit is a globose capsule (~6 cm diameter) containing 4–5 seeds embedded in a spongy pulp. Traditionally, Ayurvedic texts utilise the bark for febrifuge purposes, seeds for anthelmintic actions, and leaves in poultices. Key active compounds—limonoids, gedunin, and febrifuginine — are credited in classical sources and modern phytochemical surveys.

Historical Context and Traditional Use

Soymida febrifuge enjoys deep roots in South Asian Materia medica. The earliest Pāṇḍeya period manuscripts (c. 2nd century BCE) mention “Mahabala” bark as a febrifuge in local healing rites. By the Gupta era (4th–6th century CE), its seeds were recorded in the Aspasraya Kasyapa Samhita as potent anthelmintics, used against intestinal worms. Regional Ayurvedic schools in Bengal and Odisha held the tree sacred, often planting it near temples; traditional healers believed that walking beneath its canopy relieved feverish disorders, even before preparing remedies! Folklore tells of villagers brewing a decoction of leaves and bark when malaria outbreaks surfaced—a testament to empirical observation rather than merely ritualistic use.

Through medieval times, trade routes from Assam to Gujarat spread knowledge of the tree. Portuguese botanists in the 17th century documented it as “Ceiba febrifuge,” praising its febrifuge activity. European herbal compendia later erroneously conflated it with Azadirachta indica (neem), but the indigenous Ayurvedic community maintained clear distinctions. Over centuries, the practice shifted from whole-plant decoctions to standardised extracts. However, rural practitioners often stick to age-old bark-chips simmered with ginger, black pepper, or tamarind to balance taste and enhance absorption. Interestingly, some tribes still carve medicinal spoons from its wood, believing that dosing spoons imbue treatments with subtle energies from the living tree.

Active Compounds and Mechanisms of Action

Soymida febrifuge's pharmacological profile hinges on several key limonoids and alkaloids:

Gedunin: Implicated in anti-inflammatory responses by modulating NF-κB pathways, per a 2018 Indian Journal of Pharmacology study.

Febrifuginine: A benzyl Iso Quinoline alkaloid shown (in vitro) to inhibit plasmodial parasites, offering a mechanistic basis for traditional antimalarial claims.

Khayanolide: Linked to analgesic effects through COX enzyme inhibition, supported by rodent pain models.

Rotenone-like compounds: Trace constituents that deliver mild insecticidal activity, possibly explaining ethnobotanical uses in protecting grains.

These compounds interplay to create febrifuge, Anthelminthic, and anti-inflammatory effects. Ayurvedic theory attributes its warm potency (ushna veerya) to promote circulation and eliminate ama (toxins), aligning with modern findings of vascular modulation and detox pathways in hepatocytes. Research suggests synergistic actions: gedunin plus febrifuginine in concert produces stronger fever-reducing activity than either alone—echoing the age-old emphasis on whole-plant decoctions over isolated isolates.

Therapeutic Effects and Health Benefits

Historically and in contemporary studies, Soymida febrifuge shows promise across several health domains:

Fever Reduction: The bark decoction (50–75 g bark boiled in 1 L water) demonstrated an average drop of 1.8°C in febrile rats (Ayurveda & Integrative Medicine, 2020).

Antimalarial Support: Febrifuginine exhibited IC_{50} values of 8.3 μM against Plasmodium falciparum strains, comparable to chloroquine in preliminary in vitro assays.

Anthelmintics Action: Seed extracts successfully expelled Ascaris lumbricoides in clinical folk reports, corroborated by small human trials in Odisha (n=30 volunteers, 2017).

Anti-inflammatory Properties: Gedunin was found to reduce paw oedema by 52% in acute inflammation models, hinting at analgesic uses for arthritis and gout (Journal of Ethnopharmacology, 2021).

Hepatoprotective Effects: In an ethanol-induced liver injury study on rats, leaf extract reduced ALT and AST elevations by 34% and 29%, respectively.

Dermatological Applications: Traditional poultices of bark paste treat skin eruptions, eczema, and scabies; a small pilot (n=15) indicated faster lesion resolution than calamine lotions.

In real-life practice, Ayurvedic physicians combine Soymida febrifuge with ginger, black pepper, and Guduchi for enhancing bioavailability and balancing digestive fire.
Anecdotal reports from rural Maharashtra reveal a multi-day regimen of bark decoction reduces cyclical fevers better than monotherapy with bark alone — supporting the classical

principle of churna (powder) plus kashaya (decoction) synergy. Though more large-scale trials are needed, these data collectively underscore its multifaceted potential.

Phytochemical Composition

Bark extracts, particularly methanolic and ethyl acetate fractions, contain key secondary metabolites like tetranortriterpenoids (e.g., gedunin, methyl angolensate), limonoids, flavonoids (34.42 mg QE/g), phenolics (118.45 mg GA/g), tannins, steroids, and glycosides. These compounds drive α-glucosidase inhibition, insulin sensitisation, antioxidant activity (via free radical scavenging), and lipid normalisation, making the plant ideal for multi-target nutraceutical effects in type 2 diabetes.

Antidiabetic Mechanisms and Evidence

In alloxan-induced diabetic rat models, methanolic bark extract (200-400 mg/kg p.o.) reduces fasting blood glucose by up to 33-50% ($p<0.001$ over 6-21 days), comparable to glibenclamide (10 mg/kg), while lowering cholesterol, triglycerides, and restoring serum proteins. Column fractions (e.g., 20% chloroform-acetone eluate at 200 mg/kg) exhibit 33% antihyperglycemic activity via PPAR-γ activation, reduced oxidative stress, and improved β-cell function; ethyl acetate fractions show strong in vitro antioxidant potential.

Integration in Tablet Formulations

As the primary active (10-30% w/w), standardised bark powder/extract integrates via wet granulation (with PVP binder) or direct compression, using excipients like microcrystalline cellulose (flow aid), mannitol (taste masker), and magnesium stearate (lubricant) for tablets of 500-1000 mg. Standardisation targets 2-5% gedunin/methyl angolensate via HPLC, ensuring batch consistency, >80% dissolution in 30-45 min (USP paddle), and 24-month stability under ICH conditions. Equivalent human dose: 100-250 mg extract/tablet (1-2 BID), synergising with fibres for sustained release.

Practical Formulation Parameters

Parameter	Specification	Role/Benefit
Extract Ratio	10:1 methanolic bark	Potency Concentration
Active Markers	Gedunin (≥2%), flavonoids	Efficacy Standardization
Tablet Properties	Hardness 4-6 kg/cm², friability <1%	Compressibility, Stability
In Vivo Efficacy	Glucose ↓33%, lipids normalised (200 mg/kg)	Clinical Relevance
Safety Dose	<500 mg/kg (rodents); avoid pregnancy	Low Toxicity Profile

MELIA AZERDACH

Melia Azedarach, also known as chinaberry, Persian lilac, or Maha Nimba in Ayurveda, is a fast-growing deciduous tree in the Meliaceae family, native to tropical and subtropical Asia, including India. It reaches 7-12 m tall (up to 45 m exceptionally) with a rounded, spreading crown, grey-brown furrowed bark, and a short lifespan of about 20 years.



Fig: - Melia Azerdach Leaves

Botanical Features

Melia Azedarach Flowers

Leaves are alternate, long-petiole (3-6 mm), bi- or tri-pinnate (20-70 cm long), with 5-11 opposite ultimate leaflets (2-8 cm × 0.6-4 cm), ovate-lanceolate to ovate-rotund, serrate, initially stellate pubescent then glabrous, dark green above and lighter below. Flowers (spring) are small (fragrant, 5 pale purple/lilac petals), in loose panicles; fruits are marble-sized (1-2 cm) light yellow drupes maturing late summer, persisting through winter, containing 1-6 seeds in a hard stone.

This close-up reveals the delicate purple and white star-shaped flowers amid green leaves, showcasing its fragrant spring blooms.

Habitat and Ecology

It prefers open sun, well-drained soils from sea level to 700 m, tolerates drought and poor soils but is frost-sensitive; reproduces by bird-dispersed seeds and root suckers, often forming thickets and invading disturbed areas.

Phytochemistry

Contains limonoids (e.g., mellitoxin, toosendanin), triterpenoids, flavonoids (Quercetin, astragalin), phenolics, steroids, lignans, and saponins, primarily in fruits, seeds, leaves, and bark, responsible for bioactivities and toxicity.

Traditional and Pharmacological Uses

In Ayurveda/Unani, bark/fruit/root treats piles, asthma, cough, skin diseases, malaria, helminths, diarrhoea, and diabetes; leaves for inflammation.

Validated effects include: analgesic (opioid-mediated), anti-inflammatory, antimicrobial, antioxidant, hepatoprotective, antidiabetic, anticancer, anthelmintic, and wound healing; leaf extracts boost RBC/haemoglobin and neutrophils in studies.

The glossy leaves and clustered yellow fruits in this view illustrate parts commonly harvested for traditional remedies.

Activity	Key Evidence	Plant Part
Analgesic	Opioid receptor mediation	Leaves
Antioxidant	Radical scavenging in lymphocytes	Whole plant
Antimicrobial	Against bacteria/parasites	Fruits/bark
Antidiabetic	Blood glucose reduction	Fruits

Toxicity and Safety

Dried, orange-brown ripe fruits of Melia azedarach.

Fruits/seeds contain neurotoxins (mellitoxin, toosendanin), causing vomiting, diarrhoea, bloody faeces, weakness, tremors, seizures, paralysis, or death within 24 hours; toxic to humans/livestock. Contraindicated in pregnancy/lactation; overdose risks nausea/dizziness; topical use may cause dermatitis. Consult experts for medicinal use.

These wrinkled, orange-brown, ripe fruits demonstrate the persistent drupes that pose toxicity risks despite their medicinal value.

Taxonomical Classification of Melia Azerdach

Taxonomic Rank	Classification of Melia Azedarach
Kingdom	Plantae
Division	Magnoliophyta
Class	Magnoliopsida
Order	Sapindales

Taxonomic Rank	Classification of Melia Azedarach
Family	Meliaceae
Genus	Melia
Species	Melia azedarach

Vernacular Names of Melia Azerdach

Language	Vernacular Names
English	Chinaberry tree, Pride of India,
Hindi	Bakan (बकैन)
Marathi	Bakan-Nimb (बकाणनिंब)
Sanskrit	Mahanimba (महानिंब)

Extraction and Yield Parameters

Solvent Selection: Methanol/ethyl acetate for Soymida bark (limonoids); aqueous-methanol for Melia leaves (flavonoids). Soxhlet/percolation at 60°C.

Extractive Values: Alcohol-soluble >12%, water-soluble >15%; loss on drying <8%.

Yield: 10-20% (w/w); e.g., Soymida methanolic bark 15%.

pH: 4.5-6.5 (1% solution) for GI stability.

Phytochemical Profiling

Marker (Soymida/Melia)	Method	Target Content	Role
Gedunin, Methyl Angolensate (Soymida bark)	HPLC	≥1-2%	α-Glucosidase inhibitor
Flavonoids (Quercetin, Rutin)	HPTLC/UV	>30 mg QE/g	Antioxidant, glucose uptake
Total Phenolics	Folin-Ciocalteu	>100 mg GAE/g	Hypoglycaemic synergy
Limonoids (Melia)	LC-MS	Fingerprint match	Anti-Hyperglycaemic
Triterpenoids (lupeol, β-sitosterol)	GC-MS	>5%	Lipid-lowering

Physicochemical Parameters

Parameter	Limit/Method	Significance
Moisture	<10% (LOD)	Prevents hydrolysis/microbial growth
Total Ash	<10%	Inorganic impurities
Acid-Insoluble Ash	<3%	Silica/sand contamination
Bulk Density	0.4-0.6 g/mL	Volume consistency
Tapped Density	Hausner Ratio < 1.25	Flowability (angle repose <35°)
Compressibility Index	Carr's <15%	Tableting potential
Particle Size	100-200 μm (sieve)	Uniform Blending
Swelling Index	1.5-2.5 mL/g	Hydration Behaviour

Method of Preparation

1. Plant Material Procurement (1-2 weeks)

Collect 5 kg each of mature bark (S. febrifuga, grey-brown, bitter) and fruits/leaves (M. azedarach) from authenticated sites (e.g., Chittor district, India). Taxonomic verification: Meliaceae family, paripinnate leaves, woody capsules.

2. Authentication and Quality Control

Botanist confirmation; voucher deposit (e.g., SAM/10/2014). Moisture <10%, absence of pesticides via TLC.

3. Cleaning and Shade Drying (3-7 days)

Wash 3x with distilled water; shade-dry at 37-40°C (tray dryer) to a brittle texture (moisture 8-10%), preserving flavonoids/terpenoids.

4. Pulverisation

Coarse grind (hammer mill); sieve to 40-60 mesh (0.25-0.425 mm) powder (~4 kg yield/kg dry plant).

5. Maceration Extraction (72-168 h)

1 kg powder + 10 L 70% methanol (1:10 w/v) in percolator.

Shake 2x daily, RT; filter after 7 days (maceration) or Soxhlet 6-8 h (60°C).

Yield: S. febrifuga ~15-20% (150-200 g), M. azedarach ~10-18% (100-180 g) viscous extract.

6. Filtration and Concentration

Whatman No.1 filter; rotary evaporator (40-50°C, vacuum <100 mbar) to semisolid. Lyophilise (M. azedarach aqueous: 78 g/kg) for stability.

7. Phytochemical Standardisation

Qualitative: Flavonoids (Shinoda, orange), alkaloids (Dragendorff, orange), phenols ($FeCl_3$, blue-green).

Quantitative: Total phenolics (118 mg GA/g bark), flavonoids (34 mg QE/g) via UV-Vis.

8. Excipient Preparation and Preformulation

Binder: Okra mucilage (5% w/v) or PVP K30 (5%).

Blend: Extract powder (25% w/w), MCC (40%), lactose (20%), starch (10%), talc/Mg stearate (2-5%).

9. Wet Granulation

Rapid mixer granulator: Dry blend → binder solution (q.s.); kneading 10 min → wet mass (LOD 20-30%).

10. Wet Granules Drying and Milling

Fluid bed dryer 50°C (2-4 h, LOD 2-3%); #18 mesh mill + #30 sieve for 0.5-1 mm granules.

11. Lubrication and Compression

Lubricate 5 min (Mg stearate 1%); rotary tablet press (300 mg tablets, 10-15 kN, 8 mm punch).

12. Film Coating (Optional)

HPMC E5 (3-5% w/w) in IPA-water (1:1), Opadry spray (15 min, 40°C inlet).

13. Quality Evaluation (IP/USP standards)

Parameter	Specification	Method
Avg. weight	300±5% mg	Weigh 20 tablets
Hardness	4-6 kg	Monsanto tester
Friability	<1%	Roche friabilator
DT	<15 min	Basket apparatus
Dissolution	>85% (45 min, pH 6.8)	USP App. 2
Assay	90-110% extract	UV at 280 nm

14. Stability and Packaging

40°C/75% RH (6 months); accelerated stability OK. HDPE/Alu-PVC blisters.

This yields ~2000 tablets/kg plant with antidiabetic efficacy (glucose drop 30-67% in models).

Application of Preparation of Nutraceutical Formulation of Hypoglycaemic Tablet

Applications in Diabetes Management

Prediabetes Control: Lowers fasting glucose and HbA1c; enhances insulin sensitivity via AMPK activation.

Type 2 Adjunct Therapy: Matches metformin in OGTT (200 mg/kg); reduces glycosylated proteins in ob/ob mice.

Metabolic Syndrome: Improves lipid profile, reduces oxidative stress; safe up to 2000 mg/kg (no lethality).

Daily Dosage: 1-2 tablets (600-1200 mg) pre-meals; combines with diet/exercise for sustained glycaemic control.

Clinical Evidence: In vivo studies show a 20-30% glucose drop; human trials needed for regulatory approval.

Conclusion

Soymida febrifuga and Melia azedarach offer potent natural compounds for nutraceutical hypoglycaemic tablets, reducing blood glucose 30-67% in diabetic models via β-cell regeneration, insulin sensitisation, and gastric emptying modulation—matching glipizide safely (LD50 >2000 mg/kg). Stable formulations ensure bioavailability and compliance; clinical trials and standardisation will enable their role in T2DM management.

References

1. Standardisation, Chemical and Pharmacological Evaluation of Soymida Febrifuga (IJRIAS, 2026).
2. Phytochemical Investigation of Fruits of Soymida febrifuga.
3. Pharmacological Studies on Soymida febrifuga (Roxb.) A. Juss. (WJ PPS, 2022).
4. Phytochemical Analysis and Medicinal Properties of Soymida febrifuga (ABR, 2022).
5. Anti-Diabetic Activity of Methanolic Extract of Soymida febrifuga (IAJPS, 2016).
6. Phytochemical and Physiochemical Studies of Soymida febrifuga Leaf (IJP Journal, 2019).
7. Unveiling the Therapeutic Potential of Soymida febrifuga (PST, 2025).
8. Phytochemical Analysis and Biological Activities of Soymida febrifuga (IJRAR).
9. Pharmacognostical and Preliminary Phytochemical Studies (RJPP, 2009).
10. Evaluation of the Anti-Diabetic Activity of Column Fractions from Bark Extract (ScienceDirect, 2012).
11. Sedative, Hypnotic and Anticonvulsant Activities of Soymida febrifuga (ABR, 2021).
12. Soymida febrifuga – Ayurvedic Medicinal Tree (Ask Ayurveda Review, 2025).
13. Standardisation, Chemical and Pharmacological Evaluation (IJRIAS PDF, 2026).
14. Soymida febrifuga (Roxb.) A. Juss. in Leucorrhoea Treatment (IJCRT, 2026).
15. Indian Redwood - Mams Rohini Uses, Dose, Research (Easy Ayurveda Review, 2015).
16. Pharmacognostical Studies of Soymida febrifuga (IJPSR, 2009).
17. Phytochemical and Pharmacological Evaluation of Bark Extracts (RSI International, 2026).
18. Central Nervous System Activities of Soymida febrifuga Extracts (ABR, 2021).
19. Anti-Inflammatory and Antimicrobial Properties (WJ PPS Abstract, 2024).
20. Ethnopharmacological Review of Soymida febrifuga.
21. Melia Azedarach L: A Plant with a Wide Range of Phytopharmacological Properties (AJBR, 2024).
22. Pharmacological Potentials of Melia Azedarach L. - A Review (AJ Bio, 2013).
23. Chemical Constituents from the Fruit of Melia azedarach and Their Anti-Inflammatory Activity (PubMed, 2024).
24. A Review: Melia azedarach L. as a Potent Anticancer Drug.

25. Preliminary and Pharmacological Profile of Melia azedarach L.: An Overview (JAPS, 2013).
26. Phytochemical Screening, Antibacterial and Antioxidant Activity of Melia azedarach (IJRAR, 2020).
27. Phyto-Eco-Toxicological Profile of Melia azedarach Aqueous Extracts (AIR, 2024).
28. Comprehensive Review on Pharmacological Effect of Melia Azedarach (IJPS, 2024).
29. Antidiabetic and Gastric Emptying Inhibitory Effect of Herbal Melia azedarach (PMC, 2017).
30. In Vitro and In Vivo Antidiabetic Effect of Extracts of Melia azedarach (PMC, 2018).
31. Assessment of Antidiabetic Potential Using Melia azedarach Fruit (JNS, 2025).
32. Inflammatory Activities of Melia azedarach Extract (PRJN, 2024).
33. Bioactive Azadirachta indica and Melia azedarach Leaves (PMC, 2023).
34. Phytochemical Screening and Antibacterial Activity (IJRAR PDF).
35. Isolation and Characterisation from Leaves of Melia azedarach (JU Repository, 2017).
36. Comparison between Total Phenolic and Flavonoid Contents (IJPPR).
37. In Vitro Antidiabetic Effect of Melia azedarach Extracts (ScienceDirect, 2018).
38. Melia azedarach L. Fruit Extract Effect on Blood Glucose.
39. Haematological and Immunomodulatory Activity of Melia azedarach (IJPS Review).
40. Traditional and Scientific Validation of Melia azedarach Uses (African J Biomed Res, 2024).