

**A TRADITIONAL DRUG TRIBULUS TERRESTRIS AS A RENAL
REGULATOR UTILISES IN MODERN THERAPY**

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Article Received on 30 Jan. 2026,
Article Revised on 20 Feb. 2026,
Article Published on 01 March 2026,
<https://doi.org/10.5281/zenodo.18797389>

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How to cite this Article: Dr. Sangita K. Patel^{1*},
Rahul M. Oza², Manav H. Patel², Meet K. Patel²,
Rahul R. Patel², Kevin D. Sathvara² (2026). A
Traditional Drug Tribulus Terrestris as a Renal
Regulator Utilises In Modern Therapy. World
Journal of Pharmaceutical Research, 15(5), 160–
172.

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ABSTRACT

Diuretics are therapeutic agents that enhance the excretion of water and electrolytes through urine and are widely employed in the management of hypertension, edema, and renal complications. Along with synthetic classes such as loop, thiazide, potassium sparing, carbonic anhydrase inhibitors, and osmotic diuretics, several medicinal plants are also recognized for their natural diuretic potential. Tribulus terrestris Linn. (Commonly known as Gokshura in Ayurveda) is one such plant traditionally used for urinary ailments, kidney stones, and as a general renal tonic. The plant contains diverse bioactive compounds including steroidal saponins, flavonoids, alkaloids, phytosterols, and essential oils, which contribute to its pharmacological profile. Experimental studies indicate that T. terrestris promotes significant diuresis, enhances sodium and chloride excretion and exhibits a potassium sparing effect. Furthermore, it shows nephroprotective action by reducing

elevated serum creatinine, urea, and uric acid, while its litholytic effect aids in urinary stone clearance. Despite strong preclinical evidence and traditional usage, clinical validation remains limited. This project emphasizes the pharmacognostic, phytochemical, and pharmacological attributes of Tribulus terrestris with a focus on its diuretic activity and renalprotective potential.

KEYWORDS: Diuretics, Ayurveda, Tribulus terrestris, Renal regulator, Modern therapy.

1. INTRODUCTION

1.1 Traditional Drug

In Ayurveda, Gokshura Moola (the root of Gokshura) holds significant therapeutic value. It is classified as one of the ten key herbs in the classical polyherbal formulation, Dashamoola, which is widely used for its anti-inflammatory, analgesic, and restorative actions. Gokshura's profound medicinal importance is extensively documented in classical Ayurvedic treatises, such as the Charaka Samhita, Sushruta Samhita, and Ashtanga Hridaya, as well as in various Ayurvedic Nighantus. These texts not only describe its multiple synonyms and botanical features but also elaborate on its pharmacodynamic attributes (Rasa, Guna, Virya, Vipaka) and its traditional applications in urinary, reproductive, cardiovascular, and musculoskeletal disorders. Traditionally, *T. terrestris* has been utilised for its cardiotonic, Appetiser, aphrodisiac, diuretic, antiurolithiasis, and anti-helminthic effects. It also exhibits digestive and antibacterial properties that contribute to its widespread use in ethnomedicine. Modern pharmacological research corroborates many of these traditional claims, revealing a broad spectrum of bioactivities, including antihypertensive, antihyperlipidemic, antioxidant, immunomodulatory, antiinflammatory, and hepatoprotective effects. Notably, the herb demonstrates potassium-sparing diuretic activity, which can support cardiovascular health without disturbing electrolyte balance.^[1]

1.2 Modern Therapy

Tribulus terrestris (family Zygophyllaceae), traditionally known as Gokshura, has transitioned from classical Ayurvedic and Unani use into modern therapeutic practice, particularly as a renal regulator. In contemporary therapy, *Tribulus terrestris* is primarily utilized for the management of urinary tract disorders, owing to its well-documented diuretic, nephroprotective, anti-urolithiatic, and anti-inflammatory properties. Standardized extracts rich in steroidal saponins (especially protodioscin) are incorporated into herbal formulations and nutraceuticals to promote glomerular filtration, increase urine output, and facilitate the expulsion of renal calculi by reducing crystal aggregation and smooth muscle spasm in the urinary tract. Its role in preventing calcium oxalate stone formation, protecting renal tubular cells from oxidative damage, and modulating electrolyte balance without causing significant potassium loss. Additionally, modern therapy recognizes its adjunct role in benign prostatic hyperplasia-associated urinary symptoms and mild chronic kidney dysfunction, where it

supports renal clearance and reduces urinary obstruction. Thus, *Tribulus terrestris* is increasingly positioned in evidence-based herbal medicine as a safe renal regulator and supportive nephroprotective agent in integrative healthcare systems.^[2]

1.3 *Tribulus Terrestris*

Herbal diuretics are plants that naturally promote urine production by acting on the kidneys or urinary tract. Traditional frameworks, such as those in Avicenna's canon of medicine, divided them into hot (strong) and cold (mild) temperaments. Hot diuretic herbs like anise, black cumin, celery seed, fennel, parsley and asparagus were considered potent, acting as dissolvents and deobstruents, though they could be irritative or contraindicated in urinary inflammation. In contrast, cold temperament diuretics such as pumpkin, cucumber, mallow, and purslane were viewed as milder and more suitable for soothing lower urinary tract irritation. This system also reflected a qualitative assessment of both potency and traditional indications.^[3]

Some herbal diuretics produce diuresis by inhibiting the release of ADH (anti diuretic hormone) or by inhibiting the action of ADH on the uriniferous tubules. Diuresis in the body is regulated by ADH. ADH is secreted by neurohypophysis. Pulmonary veins regulate the rate of ADH release, which depends on body hydration. According to the ayurvedic test, approximately 120 plants have diuretic property due to which natural medicines have recently gained importance and popularity.^[4]

Tribulus terrestris is a well-known reputed ayurvedic drug. In ayurveda, it is popular by the name gokshura. Gokshura moola (root of *Tribulus terrestris* linn.) Is a component of dashmoola (group of ten medicinal plants principally comprising of roots as the useful part) which is used in the management of various diseases. The drug is well described in brahatrayi (charaka samhita, sushrut samhita) and ayurvedic nighantus with its synonyms and therapeutic potential.^[5]



Fig. 1: Fresh fruit of Tribulus terrestris.



Fig. 2: Dried fruit of Tribulus terrestris.



Fig. 3: Whole part of Tribulus terrestris.

Plant

This plant prefers loamy and heavy soils. It's used in boosting hormones in women and men. It's naturally occurring steroid furostanol saponins which boost the testosterone hormone. Leaves, stem, roots, fruits are used for the kidney diseases. Protodioxane in boost the nitric oxide production. Sometime increase the nitric oxide production in the male then male genital parts provide the proper blood supply. Tribulus terrestris are the Chinese system of medicine and ayurveda in India for treatment of edema, sexual dysfunctions.^[4]

Tribulus terrestris is edible in leaves and plants are useful in medicinal purposes. This plant is possibly safe but most people's when take at 750-1500 mg daily dose up to 90 days. Side effects are usually diarrhea, cramping, stomach pain.^[5,6]

This plant is commonly grown in South Africa, Asia, Sri Lanka, India, china in the warm temperatures. However, the importance of Tribulus terrestris athletes used in this plant as a enhancer of testosterone hormone for increasing the performance levels in the games. This plant is used to control the blood pressure level.^[5,6]

1.3.1 Taxonomical Classification^[7]

Table 1: Taxonomical classification of Chhota gokhru.

Kingdom	Plantae
Division	Phanerogams
Subdivision	Angiospermae
Class	Dicotyledonae
Subclass	Polypetalae
Order	Giraniales
Series	Disciflorae
Family	Zygophyllaceae
Genus	Tribulus
Species	Terrestris Linn
Local name	sarata

Botanical name	Tribulus terrestris
Parts used	Whole plant

Tribulus terrestris is an annual plant of the family Zygophyllaceae, which is commonly known as Tribulus, Hard thorns, and goat head in China. It is mainly planted in the Mediterranean and in subtropical regions such as India, China, South America, Mexico.

Spain, Bulgaria, and Pakistan. It is a small, prostrate, 10–60 cm high, hirsute or silky hairy shrub. The leaves are opposite, often unequal, paripinnate, pinnate from 5 to 8 pairs and elliptical or an oblong lanceolate. The fruits from the five mericarps are ax-shaped, 3–6 mm long, and arranged radially and have a diameter of 7–12 mm and a hard texture. The root is slender, fibrous, cylindrical and frequently branched, bears a number of small rootlets and is light brown in colour. The fruits and roots of *Tribulus terrestris*, as a folk medicine, have been used for thousands of years in China. Over the last several years, it has been certified for its pharmaceutical activities for improving sexual function and cardiac protection and providing anti-urolithic, anti-diabetic, antiinflammatory, antitumour and antioxidants effects. In the current review, we present and analyse the ethnobotanical use and the phytochemical and pharmacological activities of *Tribulus terrestris*. These up-to-date research observations will be helpful in understanding the characteristics and superiorities of this traditional Chinese medicine and will be applicable in developing new products and herbal medicines in the future.^[8]

1.3.2 Vernacular Name^[9]

Table 2: Vernacular Name.

English:	Caltrops fruits
Gujarati:	Bethagokhru
Telugu:	Palleru kayalu
Hindi:	Gokhru
Tamil:	Nerinjil
Sanskrit:	Shvadanstra
Oriya:	Gukhura
Kannada:	Sannaneggilu
Marathi:	Sarate Kashmiri: Michirkand
Urdu:	Khorkashak
Punjabi:	Bhakhra

1.3.3 Chemical Constituents^[10]

Table No. 3: Chemical constituents in Chhota gokhru.

SR NO.	GROUP OF PHYTOCHEMICAL	PHYTOCHEMICALS
1	Alkaloids	Tribulusin A, Tribulusamide C, Tribulusterine, Terrestriamide, Harman, Harmine, Harmmol, N-trans-caffeoyltyramine, N-transcoumaroyltyramine
2	Flavonoids	Kaempferol , isorhamnetin, quercetin
3	Saponins	108 types of steroidal Saponins (e.g. protodioscin), 58 types of Spirostanol and 50 types of furostanol
4	Amino acids	Alanine and threonine
5	Organic acids	Benzoic acid, Vanillic acid, 2-methyl benzoic acid ferulic acid, succinic acid, palmitic acid
6	Glycoside	Tribulosin
7	Others	Dioscin, Quercetin, Rutin, Tannins, Phytosterols, Fixed oils, Essentieals oils

1.3.4 Mechanisms of Action^[11,12,13,14]

The exact mechanism by which *Tribulus terrestris* promotes diuresis. Experimental studies suggest it enhances renal excretion of water and electrolytes, particularly sodium and chloride. Some extracts appear to act as **potassium-sparing diuretics**, since urinary potassium is not always significantly lost. This indicates modulation of tubular reabsorption rather than a direct loop-diuretic effect.

Kaempferol from three main constituents responsible for diuresis, **inhibit Na^+/K^+ ATPase pump** and promotes diuresis.

Tribulosin and **Protodioscin** increase glomerulus filtration, decrease reabsorption of water from DCT by act as **Aldosterone inhibitory action**.

Chhota Gokhru **extract** also gives **$\text{Na}^+/\text{K}^+ / 2 \text{ Cl}^-$ Co-transporter inhibitory actions**, **renal vasodilatory effect**.

Additionally, smooth-muscle contractile activity observed in isolated guinea pig ileum suggests a spasmogenic action that may help propel urine and small calculi through the urinary tract. The presence of lanostane triterpenoids and antioxidant flavonoids may also protect renal tissues, support overall kidney function and indirectly enhancing diuresis.

2. NUTRITIONAL COMPOSITION IN FRUIT OF CHHOTA GOKHRU^[10]

Table 4: Nutritional Composition in fruit of Chhota gokhru.

Item	Concentration
Moisture (% wet weight)	65.3%
Fat (%)	1.1%
Fiber (%)	0.5%
Crude Protein (%)	21.33%
Ash (%)	5.3%
Carbohydrates (%)	55.6%
Energy Value (Kcal/100g)	292.64 Kcal/100g
Calcium (mg/100g)	142 mg
Potassium (mg/100g)	220 mg
Iron (mg/100g)	2.8 mg
Phosphorus (mg/100g)	23.04 mg
Magnesium (mg/100g)	30.4 mg
Sodium (mg/100g)	5.0 mg
Zinc (mg/100g)	0.5 mg
Copper (mg/100g)	1.28 mg

3. TRADITIONAL USES^[11,12]

- 1. Diuretic action:** Helps increase urine output. Used in traditional medicine for urinary tract infections, kidney stones, and water retention.
- 2. Aphrodisiac and libido enhancer:** Boosts sexual desire and performance in both men and women. Commonly used in Supports heart health by reducing blood pressure and cholesterol.
- 3. Enhances physical performance:** Used by athletes to increase strength, endurance, and muscle mass.
- 4. Antioxidant properties:** Protects cells from oxidative stress and free radical damage.
- 5. Blood sugar regulation:** Shows potential in lowering blood glucose levels.
- 6. Antibacterial and antimicrobial:** Effective against various bacterial and fungal infections.
- 7. Skin disorders:** Used in traditional remedies for eczema, psoriasis, and skin rashes.
- 8. Liver protection:** Shows hepatoprotective effects, supporting liver function.

4. SAFETY, SIDE EFFECTS AND HUMAN DATA

4.1 Safety Assessment of *Tribulus terrestris*

▪ General safety profile

Tribulus terrestris is widely used in Ayurveda, Traditional Chinese Medicine, and Unani for urinary disorders, sexual dysfunction, kidney stones, and cardiovascular health. Most studies suggest it is relatively safe when used in recommended doses for short to moderate duration.

▪ Reported safe uses

Clinical trials (mainly on men for sexual health, and on animals for diuretic/renal protection) have shown no major toxicity at standard doses (250–1500 mg/day of extract).

▪ Animal studies

LD50 (lethal dose) is high → suggesting low acute toxicity. Safety of *Tribulus terrestris* Linn.

▪ General safety

Traditionally used in Ayurveda, Unani, and Chinese medicine for urinary, reproductive, and cardiovascular disorders.

Generally safe in recommended doses (250–1500 mg/day of standardized extract) for short–moderate duration.^[18,19]

▪ Experimental and clinical evidence

1. Toxicity studies

Acute and sub-chronic toxicity studies in rats and mice reported no significant toxic effects up to high doses. LD50 values suggest low acute toxicity.^[13]

2. Adverse events

Case reports mention rare side effects: Gastrointestinal upset, abdominal cramps, nausea. Potential nephrotoxicity in sheep and cattle after ingesting contaminated pastures (not seen in controlled human doses).^[19]

3. Human clinical trials

Clinical trials on men with erectile dysfunction and athletes showed safe tolerability at doses of 750–1500 mg/day. No hepatotoxicity or nephrotoxicity observed.^[20]

4.2 Side Effects of *Tribulus terrestris*^[21,22]

Chhota Gokhru (*Tribulus terrestris*) is generally considered safe when used in recommended amounts, but excessive or inappropriate use can lead to side effects such as digestive issues, allergic reactions, hormonal changes and interactions with medications.

Common side effects: Digestive issues: Symptoms such as bloating, diarrhoea, stomach pain, nausea, constipation, and vomiting may occur, especially if taken in high doses or on an empty stomach.

Allergic reactions: Some individuals may experience skin rashes, redness, itching, hives, or irritation due to plant proteins.

Hormonal effects: Chhota Gokhru can affect hormone levels, particularly testosterone, luteinizing hormone (LH), and follicle-stimulating hormone (FSH), which may lead to hormonal imbalance when consumed excessively.

Difficulty sleeping: Rarely, users may experience insomnia or trouble sleeping.

Medication interactions: Its diuretic properties may interact with diuretic drugs and cause electrolyte imbalance or dehydration; it may also interact with blood pressure, diabetic, and hormone-related medications.

Lower blood sugar: Can enhance the effects of anti-diabetic drugs and might lower blood sugar excessively.

Pregnancy and breastfeeding risks: It is recommended to avoid use during pregnancy and lactation due to potential risk and lack of safety data.

Precautions: Use only in recommended dosage and take breaks from continuous usage.

Avoid use during pregnancy and breastfeeding. Consult a healthcare practitioner if there are existing medical conditions or medications being used, especially related to kidneys, hormones, diabetes, or blood pressure. People with sensitive immune responses should start with a small amount to test for allergies.

4.3 Human data of *Tribulus terrestris*

1. Erectile dysfunction (men)

Dose: 250–750 mg/day extract, 3 months **Findings:** Improved libido and mild erectile function improvement; well tolerated.^[23]

2. Female sexual dysfunction

Population: 50 women with hypoactive sexual desire.

Dose: Tribulus extract standardized to saponins (7.5 mg/day), 90 days **Findings:** Improved desire, arousal, lubrication; no serious side effects.^[19]

3. Athletic performance (elite rugby players):

Population: 22 athletes.

Dose: 450 mg/day extract, 5 weeks, **Findings:** No significant changes in strength or body composition; safe use confirmed.^[24]

4. Type 2 diabetes and metabolic syndrome: Population: 98 patients with T2DM **Dose:** 1000 mg/day extract, 3 months, **Findings:** Lowered blood glucose, improved lipid profile, no adverse effects.^[25]

5. Testosterone / endocrine effects:

Population: 40 healthy young men.

Dose: 750 mg/day extract, 5 weeks, **Findings:** No significant change in serum testosterone; safe profile.^[26]

5. CONCLUSION

The current study emphasizes *Tribulus terrestris* gives action as diuretic and protective effects on renal function. Its bioactive phytochemicals like steroidal saponins (**protodioscin, Tribulosin, kaempferol**), flavonoids, alkaloids and phytosterols that contribute therapeutic potential, traditional practices and classical ayurvedic texts. It uses to treat kidney stones, hypertention, oedema, sexual health and urinary disorders etc.

Tribulus terrestris extracts promote increased sodium and chloride excretion, significantly enhance urine output, and may exert potassium-sparing diuretic effects. In addition, the plant demonstrates litholytic and nephroprotective properties, reflected by reduced serum creatinine, uric acid, and urea levels. Beyond renal benefits, *Tribulus terrestris* has also shown potential in improving sexual dysfunction, regulating blood pressure, and alleviating features of metabolic syndrome.

Overall, *Tribulus terrestris* emerges as a safe and promising natural diuretic and renal protective agent with multifaceted applications. Its integration into modern therapeutics may offer a natural, effective alternative or adjunct to conventional diuretics, particularly in populations which suffering from hypertension, kidney stones and oedema.

6. ACKNOWLEDGEMENT

We express our sincere gratitude to respected guide **Dr. Sangita K. Patel** for her valuable guidance, constant encouragement and continuous support throughout the course of this review work. Her scholarly advice and constructive suggestions have been instrumental in the successful completion of this work.

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