



Exploring The Medicinal Efficacy Of Gokharu (*Tribulus Terrestris*) Across Traditional And Modern Healthcare.

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Abstract: *Tribulus terrestris* L., commonly known as Gokharu or Gokshura, is an herb belonging to the family *Zygophyllaceae*, found in diverse global regions, particularly in arid and warm areas. Known for its distinct spiny fruit, it has traditional medicinal applications across systems such as Ayurveda, Chinese, Siddha and Unani. Its phytochemical composition includes saponins, flavonoids and alkaloids, which have been linked to its medicinal properties. Research highlights its pharmacological activities, including aphrodisiac, anti-inflammatory, antibacterial, diuretic and anti-urolithic effects, which support its use in treating genitourinary disorders, sexual dysfunction and inflammatory conditions. Modern studies indicate that Gokharu shows potential in clinical applications like managing benign prostatic hyperplasia, diabetes-related complications and nephrolithiasis. Given its versatility, Gokharu remains a promising candidate for further therapeutic research and development.

Keywords: *Tribulus terrestris*, Gokharu, Traditional medicine, Benign prostatic hyperplasia (BPH), Nephrolithiasis.

Introduction: *Tribulus terrestris* L. (Family: *Zygophyllaceae*), an annual, infrequently perennial prostate herb, has been recognized as Gokshura on roadsides, weed grasslands and other landfills. [1] Originating in the mediterranean region, it is found all over the world between latitudes 35° south and 47° north. [2] The family *Zygophyllaceae* comprises flowering plants. These include thistles and legumes. This family comprises over 285 species and 22 genera.

[3] *Tribulus* is derived from the latin *tribo*, meaning "tear," and "*caltrop*" are latin words referring to the form of this plant's fruit like a ball of jagged metal that is used as a hurling weapon during medieval conflicts at the base of a horse. The latin word *terrestris* means "earth" and refers to plant's tendency toward creeping growth. [4] The plant reaches a maximum length of 90 cm [Fig. 1]. Each of the five to twelve woody cocci that make up the globose fruit has two pair of hard, sharp and forked spines, with a longer pair than the other. Each coconut has several seeds, which are separated by horizontal dividers. [5]



fig. 1. shows a whole fresh plant of *t. terrestris* linn. and a whole dry plant of *t. terrestris* linn. [5]

Taxonomical classification:

- Kingdom: Plantae
- Division: Phanerogams
- Subdivision: Angiospermae
- Class: Dicotyledonae
- Subclass: Polypetalae
- Series: Disciflorae
- Order: Giraniales
- Family: Zygophyllaceae
- Genus: Tribulus
- Species: *Terrestris* Linn. [6,7]

The Plant Profile:

Common names for TT include Gokshur (Sanskrit); Gokharu (Hindi); puncture vine; land (or little) caltrops (English); Bethagokharuor, Khar-e-khusak; Nerinjil (Tamil); or Nanagokharu (Gujarathi); Khurd (Urdu). It is dispersed over a large geographic area. It can be found throughout India up to 11,000 feet in places like Ceylon and Kashmir, as well as every warm area in both hemispheres. It's a typical weed of the roadsides, grazing areas and other waste areas, primarily in areas that are hot, arid and sandy, such as West Rajasthan and India's Gujarat state. [8]

Distribution: Up to 5,400 meters over India, as a weed in waste areas and beside roadsides. The study of morphology Gokshura is an herb that can be either annual or perennial and has several spreading thin branches, with the immature parts coated in a delicate, velvety hair.

Leaves: Usually, the leaves are arranged in opposition to each other lopsided, suddenly pinnate with four to seven simple leaflets that are nearly sessile to the stem of the leaf.

Flowers: White or yellow, solitary, axillary or leaf-opposed. The single yellow blooms, each with five petals are reproduced in the axils of the leaves.

Fruits: The globose, hairy, five-angled, spinous fruits have each cocci has two long and two short spines comprising several seeds. [9]

Chemical constituents:

The initial phytochemical analysis of TT showed that tannins, alkaloids, glycosides, flavonoids and saponins were present. [10] Based on data from the literature, the saponin composition and the amount of saponin in TT from various geographical each region is unique. [11] Kostova and colleagues investigated the chemistry and saponins' bioactivity in TT. As they stated, furostanol, tigogenin, neotigogenin, gitogenin and spirostanol saponins diosgenin, chlorogenin, hecogenin, neogitogenin and types of ruscogenin and sarsasapogenin are commonly found in this plant. Furthermore, four tigogenin-sulfated saponins and the diosgenin type were separated. Furostanol makes up the majority of glycosides, such as protogracillin and protodioscin of which the most prevalent spirostanol and saponin is protodioscin, there are trace amounts of glycosides. [11,12] According to Wu et al. there are almost 1.5 times as many major flavonoids as there are primary saponins. This suggested that TT's flavonoid contents ought to be researched, created and applied further. [13] Kaempferol, kaempferol-3-glucoside, kaempferol-3-rutinoside and tribuloside [kaempferol-3- β -d-(6''-p-coumaroyl)] were isolated by Bhutani et al. glucoside from fruits and plants and recognized them via spectroscopic examination. [14] Louveaux and colleagues found 18 flavonoids (derivatives of caffeine, quercetin glycosides, kaempferol and rutin glycosides etc.), with high-performance liquid chromatography (HPLC) in leaf extracts from four Tribulus species. [15] The extraction condition was adjusted by Yang et al. utilizing orthogonal. [16] Matin Yekta and colleagues identified three flavonoids, quercetin 3 O-glycoside, quercetin 3 O-rutinoside and other glycosides and kaempferol 3-O-glycoside from *T. terrestris*'s aerial sections Northeastern Iran, *L. var. orientalis* (Kerner) G. Beck. [17] Raja and Venkataraman used an ethyl acetate:benzene (1:9) solvent to identify flavonoids from petroleum ether and chloroform extracts of fresh TT fruits from India. The fruit did not contain these flavonoids extracts from another type, specifically *T. alatus*. Therefore, the presence of pharmacognostic components that might be utilized as a diagnostic instrument for species identification and research of adulteration or pollution. [18,19] Tian Shung and associates isolated and described three novel substances: terrestribisamide, in addition to 25R-spirost-4-en-3, 12-dione, and tribulusterine, ten recognized substances, including terrestriamide, N-p-coumaroyltyramine, xanthosine, fatty acid ester, hecogenin, aurantiamide acetate, ferulic β -sitosterol, vanillin, p-hydroxybenzoic acid and acid, from the TT's dried fruits. [20] There are alkaloids such as harmane and norharmane, there is tribulusterine and alkaloid of β -carboline in little amounts in fruits. [21] The presence of α -amyrin was identified by gas chromatography-mass spectrometry analysis of a methanolic extract of the entire TT plant. Seven minor components and one main component which are tetramethyl-2-hexadecen-1-ol, nhexadecadienoic acid, 3, 7, 11, 15, 9, 12-octadecadienoic, phytol, hexadecadienoic acid, ethyl ester acid, 1,2-benzenedicarboxylic acid, 9, 12-15-octadecatrienoic acid and dioctyl ester of acid. Sterols like stigmasterols and β -sitosterols were discovered to be present as well. [22]

Pharmaceutical Actions and Scientific Evidence of Classical Uses of Gokshura:

The following biochemical and pharmacological actions have been published, according to a review:

Anthelmintic action: It was discovered that the methanolic extract worked better than petroleum ether, chloroform and water extracts, for anthelmintic activity in vitro on *Caenorhabditis elegans* nematode. Additional confirmation of bioactivity-guided fractionation β -sitosterol-d-glucoside and tribulosin to be the active ingredients with 76.25 and 82.50 ED₅₀ μ g/ml, in that order. [23,24]

Antifungal and Antibacterial properties: Antimicrobial activity was demonstrated by the ethanol extract against gram-negative and gram-positive bacteria, antifungal and antibacterial activities. [25] The fruit methanolic extract was discovered to be the most resistant to both gram-positive and gram-negative bacteria, although there was some activity seen in its chloroform and petroleum ether extracts. [26] An extract of the dried whole plant in chloroform was active against *Mycobacterium* on an agar plate, MIC 41.6 g/liter for phlei. [27] The whole dried plant extract is also discovered as active. [28]

Antifilarial Action: The plant's hot water extract combined with 15% *Melia rachta*, 15% *Sida cordifolia* and 5%

T. terminaliachebula (39%), *Terrestris* (12%) and at a concentration of 19% *Tinospora cordifolia* weak action was observed at 100 mcg/ml on *Maviteae thochelone* concentration of it was active at 500 mcg/ml. [29]

Anti-Inflammatory Activity: Mice were given the dried fruit via stomach intubation at a dosage of 2 g/kg in a preparation including, *Aconitum sinense*, *Bombyx mori*, *Mentha arvensis*, *Sophora* and *Alpinia species flavescens* exhibited activity in contrast to dextran-induced dye leakage into the peritoneum and pedal edema cavity and paw irritation brought on by yeast in a model of rats. [30] The expression of inducible nitric oxide synthase and cyclooxygenase-2 (COX-2) was suppressed by the ethanolic extract of TT. The lipopolysaccharide stimulated INOS RAW264.7 cells. Additionally, it repressed the expression of cytokines that promotes inflammation, including TNF- α , or tumor necrosis factor-alpha and in the macrophage cell line, interleukin (IL)-4. Consequently, TT's ethanolic extract suppresses the expression of inflammation-related mediators and inflammatory cytokine expression, which has a positive impact on different inflammatory circumstances. [31]

Antispasmodic Activity: At a dosage of 10 mcg/ml, a 95% ethanol extract of the whole plant demonstrated activity on the guinea pig ileum against acetylcholine, histamine and spasms brought on by barium chloride. [32] The plant's lyophilized saponin combination showed a notable reduction in the peristaltic motions of preparation of rabbit jejunum in a dose-dependent way. These findings demonstrated that the saponin blend could be beneficial for smooth muscle aches or spasms. [33]

Aphrodisiac Activity: Research on pharmacology and phytochemistry in both people and animals showed a significant function for the treatment of erectile dysfunction using *T. terrestris* and issues with sexual drive. Additionally, it was reported that *T. terrestris* is a medication with greater promise than *Kapikachhu* and *Ashwagandha*, each of the three medications is effective for enhancing sexual function and behaviour by raising testosterone levels and controlling Nrf2/HO-1 and NF- κ B male rat routes. [34] The two primary elements that make up the saponin portion from the plant, namely protogracillin and protodioscin, are accountable for the biological aphrodisiac properties of ethanolic extract. [35] A preventive effect against testicular damage caused by cadmium was demonstrated by ethanolic extract. The protective effect seems to be directly mediated by either prevention of peroxidation in testicular tissue by metal-chelating and antioxidant properties or by promoting the synthesis of testosterone from Leydig cells. [36]

Improvement in Benign Prostatic Hyperplasia: An extract of the dried plant in hot water, in a preparation that included *Orchis mascula* as well as *Macuna*, *Aster cantha longifolia* and *Lactuca serriola*, *Argyrea speciosa*, *Pruriens*, *Oarmeliaperlata*, *Gold* and *Leptadenia reticulata*, was taken orally by 10 individuals and 45 patients with prostatitis acting as untreated controls of the 38 patients in the test group with benign hyperplasia, 28 got better and didn't require surgery. Every single one of them prevents the need for surgery. [37]

Activity Against Urolithiasis: Rats were given a dosage of ethanol (95%) extract of the dried fruit intragastrically, 25 mg/kg was more effective than seed-induced cystolithiasis. [38] Fruit extract in ethanol was examined in glass bead-induced urolithiasis albino rats for implantation. It showed notable dose-dependent defense against the buildup of surrounding the glass bead with calculogenic substances elevated serum, urea levels and leukocytosis. [39]

CLASSICAL USE:

Traditional medicine uses TT as a diuretic, lithotriptic, astringent, stomachic, aphrodisiac, palliative and antihypertensive and disinfectant for the urine. The herb's dried fruit is extremely useful for the majority of genital tract conditions. It is an essential component of the powerful Ayurvedic medication Gokshuradi Guggul utilized to promote the genitourinary system's healthy operation tract as well as to get rid of the kidney stones. TT has been employed for millennia in ayurveda to cure sexually transmitted infections, impotence and sexual ineptitude. The herb is used as a traditional remedy in Bulgaria for the treatment of impotence. Together with all of these uses, according to the Indian Ayurvedic Pharmacopoeia, cardiotonic characteristics of the fruit and root. In Chinese traditional medicine, the fruits were used to heal eye conditions. [40]

❖ Medicinal properties of Gokharu

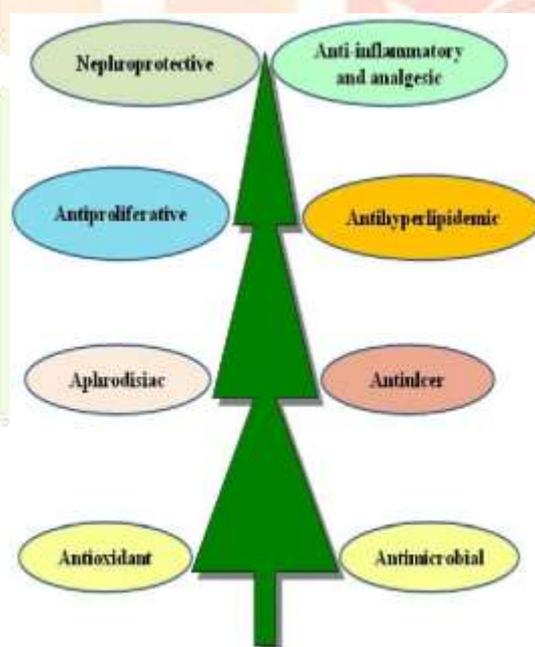


fig. 2: showing. medicinal properties of gokharu [41]

Method and Technique:

Resources and methods for using the medicinal plant *Tribulus terrestris* for a range of applications:

Resources:

1. The dried fruits or aerial parts of the Gokharu plant (*Tribulus terrestris*) are frequently utilized in conventional medicine.
2. Water or other appropriate extraction solvents.
3. If necessary, use a grinder or mortar and pestle to grind the plant material.

4. If necessary, use a sieve or filter paper for filtration.
5. Glass storage containers for preparations or extracts.
6. Optional: Extra ingredients for certain uses including, alcohol, carrier oils or herbs components for a mixture or composition.

Techniques: Gokharu

1. **Plant Collection and Preparation:** The mature fruits or aerial parts of the Gokharu plant are gathered and dried in a shaded area or using another appropriate technique to preserve their therapeutic qualities. They can be kept in an airtight container after drying until it's needed again.
2. **Gokharu Plant Extraction:** There are several ways to extract gokharu, including decoction, infusion, maceration and cold percolation. Making a decoction by boiling the dried plant components in water for a long time is a popular technique. After a certain amount of time, typically 15 to 30 minutes, the liquid is filtered to extract the extract.
3. **Creation and Blending:** Gokharu extract can be used either by itself or in combination with other herbs, depending on the intended use ingredients or carrier oils. [42,43]

GOKSHURA CLINICAL TRIAL:

Gokshura has been the subject of numerous clinical studies, including those on sexual dysfunction in women and male sexual dysfunction activity. [44,45] Hypoglycemic and hypolipidemic activity in women with diabetes mellitus, erectile dysfunction and LUTS (lower urinary tract symptoms) in late-onset hypogonadism activity. [46] Benign hyperplasia of the prostate. [47,48] Diabetes mellitus and microalbuminuria. [49,50] Oligozoospermic activity symptoms of the menopausal transition. [51] Nephrolithiasis. [52]

• Application of Gokharu

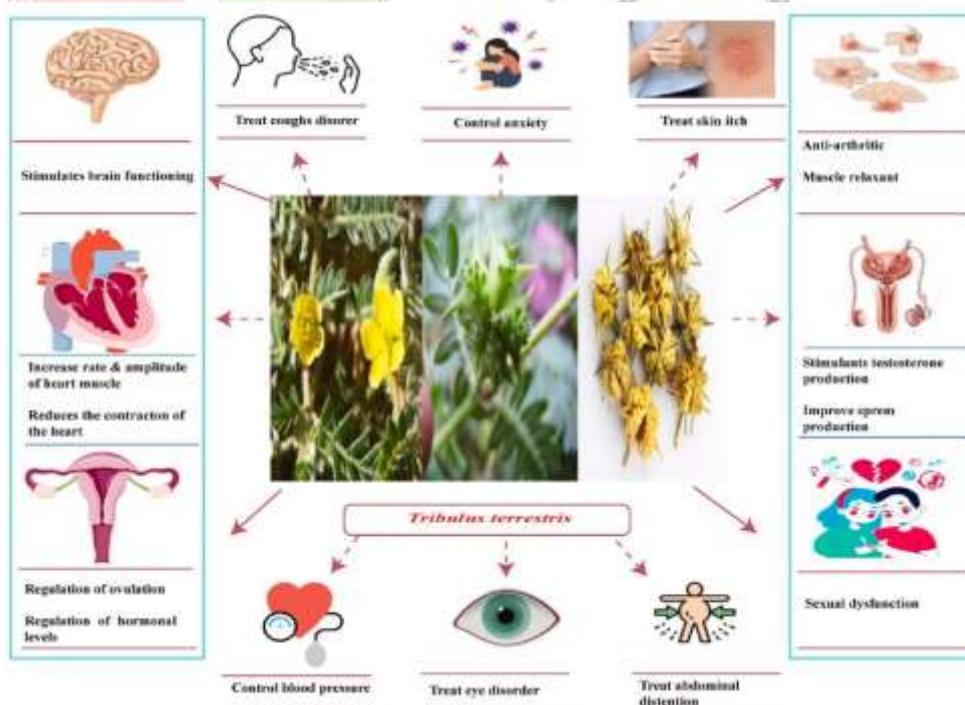


fig.3: the different promising traditional use of tribulus terrestris.[53]

Conclusion:

The study found that Gokshura, a dietary supplement (Vasco-dilator), improved muscle mass in the experimental group and led to greater adaptation. The placebo group's mass did not meet the expected threshold when compared to the experimental group, this could be due to reduced degree adaptability to the training plan provided by the study. Absence of Gokshura supplementation could have resulted in lesser levels of adaptation.

According to the study, 60% of patients experienced complete clinical and biochemical improvements. 30% of patients have received better alleviation; 10% have not improved. The investigation revealed that Gokshura possesses the antimicrobial action of the organisms. The cause of a lower urinary tract infection, Gokshur acts as a mild diuretic medication. Used in different illnesses when there is fluid imbalance, such as heart, renal and liver disorders. Additionally, it can be used in patients who have pedal edema, ascites and generalized anasarca. Again, it can be applied to those who have acquired a tiny kidney calculus to flush out the stone. This medication is a very weak diuretic. Gokshura has been utilized for ages in Ayurvedic medicine. It has been used to treat sexual problems. Gokshura TT, a readily available weed, has substantial benefit in traditional medicinal systems like Ayurveda, Chinese, Siddha and Unani. TT is also a well-known herb in folk medicine. Many countries have a variety of diseases. The complete plant of TT has been thoroughly investigated for its phytochemicals and pharmacological activity, such as diuretic, aphrodisiac and antiurolithic. Immunomodulatory, antihypertensive, antihyperlipidemic, antidiabetic, hepatoprotective, anticancer, anthelmintic, antibacterial, analgesic and anti-inflammatory. Consider the available according to the literature on TT, the plant may offer potential as a herbal because of its diuretic properties, this drug is useful at controlling blood pressure, Potassium-sparing activity, antihyperlipidemic activity, cardioprotective action. Although TT has been widely utilized over the years, now scientific evidence with regard to its pharmacological actions is also being produced.

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