



## **Complete description of Khar-E-Khasak (*Tribulus terrestris* Linn.): a potent medicinal herb for Nephrolithiasis**

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### **ABSTRACT**

Unani system of medicine is well known and famous way of treatment in Indian sub continent. India is the hub and savior of this ancient and rational system of medicine; included as giant part of Indian System of Medicine combined comes under AYUSH. Hundreds of herbal drugs in various forms for range of disease are in use as single as well as in compound form in this system. Khar-e-Khasak (*Tribulus terrestris* linn.) is a multi action single herbs being prescribed in various forms and combination since ages. Khar-e-Khasak is a drug mentioned in the Unani & Ayurvedic system of medicine for various ailments but mainly as a diuretic, Lithotriptic and Litholytic. In this research article authors try to mention the complete description of the said drug; modern as well as traditional both. Their physical as well as chemical characteristics are also being mentioned so as it may be referred as complete information for future research and readers.

**Keywords:** Khar-e-Khasak; *Tribulus terrestris* linn.; diuretic; Lithotriptic; Litholytic; Unani.

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## INTRODUCTION

Khar-e-Khasak is a special Unani Medicine to prevent recurrent urinary tract infections and stone formation. It also clears the urinary tract and kidney stones quickly. Khar-e-Khasak helps to form a healthy urinary tract keeping the pH level of the urine in such a range that it is not good for formation of kidney stones. Khar-e-Khasak has conventional aid in maintaining alkalinity and works like nature's best diuretic that greatly relieves pain, swelling and accumulation of water<sup>1,2,3,4</sup>. It is said to have property of breaking and disintegrating the stones and is widely used drug<sup>1,2,3,4</sup>.



**Figure: 1: Khar-e-Khasak dry fruit**

**History:** **Khar-e-Khasak (*Tribulus terrestris* linn.)** is being used since thousands of years by Unani physicians. Jalinoos (Galen (131-210 A.D.), Deescoridus and Ishaq bin Imran (900 A.D.) have mentioned this medicine in their books. Hippocrates disbelieved in all the stone solvents but used the same as diuretic. Bu Ali Sina (Avicenna) recommended the use of laurel, cypress oil and ashes of scorpion egg shells, melon seeds etc. for the dissolution of stone<sup>1,2,3,4</sup>.

**Ayurvedic classics also contain many descriptions for dissolving the stone.**

In Ayurvedic literature, "Charak Samhita" (210 BC-170 AD) under the name Ghokshru, It is recommended for painful micturition, to cure abdominal tumor and for breaking up calculi<sup>1,2</sup>.

Sushruta prescribes its root in combination with other drugs in the treatment of scorpion sting, but it is not an antidote to scorpion venom (Caius and Mahaskar)<sup>1,2</sup>.

**Scientific classification**<sup>1,2,3,4,5,6</sup>.

Kingdom:	Plantae
Division:	Angiospermae
Class:	Dicotyledoneae
Order:	Geraniales
Family:	Zygophyllaceae

Genus:	Tribulus
Species:	terrestris Linn.
<b>Botanical synonym:</b>	Tribulus languinosus Linn.
<b>VERNACULAR NAME:</b>	<sup>1,2,3,4,5,6</sup> .
<b>Unani Tibbi Name:</b>	Khar-e-Khasak, Azras-al-ujooz, Hasak.
<b>Botanical Name:</b>	Tribulus Terrestris linn.
<b>Arabic:</b>	Akhwas-ul-juz, Khasak
<b>Urdu:</b>	Ghokharu, Hasak, Gokhru khurd.
<b>Persian:</b>	Khar-e-Khasak
<b>Assamese:</b>	Ghokshru Gokhuvkata
<b>Bengali:</b>	Ghokshura, Gokhri, Ghokhru, Gokhura.
<b>English:</b>	Caltrops fruits, Small Caltrops, Land- caltrops, Puncture-vine.
<b>Hindi:</b>	Chota Gokhru, Gokshri, Burragokhur
<b>Kannada:</b>	Negalu, Sennanegalu, Neggilamullu.
<b>Kashmiri:</b>	Michirkand, Pakhda.
<b>Malayalam:</b>	Nerinnil, Nerinjil, Nerungil, Nerinji.
<b>Marathi:</b>	Sarate, Gokharu, Lahanagokharu,
<b>Oriya:</b>	Gukhuru, Gokhyura, Gokshra, Gokhura.
<b>Panjabi:</b>	Bhakhra, Gokhru, Bhukri, Gokhru desi.
<b>Tamil:</b>	Nerinci, Nerinnil, Nerinjil, Nerinji.
<b>Sanskrit:</b>	Goksurah, Traikantaka, Bahukantaka.
<b>Telugu:</b>	Palleru, Cinnapalleru, Pellerukayaru.

**Habitat:**

The plant abundantly grows throughout of India up to 5400 meter (sea level). Abundant in Kashmir 3,000 m(sea level), Bihar, Andhra Pradesh, Tamil Nadu, North-West States and the Gangetic plains<sup>1,2,3,4,5,6,7</sup>.

**Period of occurrence:**

Plant grows more or less throughout the year and flowering takes place from September to December. Fruits mature between May to June<sup>11,2,3,4,5,6,7</sup>.

**Part used:** Dried spiny fruit<sup>1,2,3,4,5,6,7</sup>.

**Botanical description:**

An annual or perennial, prostrate herb with many slender, spreading branches, 30-60 cm. and silky-villous young parts. Leaves are abruptly simple, pinnate and opposite. Leaflets 3-6 pairs

almost sessile, rounded or oblique at the base, mucronate 6-12cm. at the apex, flowers bright yellow, solitary, pseudo axillary or leaf opposed. Fruits are 5 angled or winged spinous tuberculate woody schizocarp, separating into five cocci, each coccus having two long, stiff, sharp divaricate spines towards the distal half and two shorter ones nearer the base, seeds one or more in each coccus<sup>1,2,3,4,5,6,7</sup>.

**Procedure and time of collection:**

Fruits are collected during the month of May and June, generally by hand, but sometimes the whole herb is gathered and then the spiny fruits are separated.

Preservation and storage: Fruits are dried in shade, thoroughly garbled and stored in bottles and preserved in a cool and dry place. Fruits retain their medicinal efficacy for a period of about 6 month's only<sup>1,2,3,4,5,6,7</sup>.



**Figure: 2: Khar-e-Khasak ripe fruit. Khar-e-Khasak plant**

**PHARMACOGONOSY**

**Macroscopic:**

Fruit about one cm. in diameter, yellow in colour, tough, globose, consisting of five woody wedge-shaped cocci, each with two pairs of sharp, hard, about 2mm. long spines, one pair larger than the other. External surface rough. Seeds small, pale brown, 2-3 superposed in each schizocarp. Average weight of single fruit is 0.182gm.<sup>1,2,3,4,5,6,7,8</sup>.

**Microscopic:**

Cross-section of the fruit reveals the five wedge-shaped coccus lined externally by single layered epidermis, the cells of which protrude outwards to form long, pointed, unicellular trichome. Major portion of the fruit wall is occupied by large thin-walled parenchymatous cell.

Fruit wall is limited on inner side by a distinct zone of sclerenchymatous cells which in turn encloses a cavity for seed. Outer layers of testa are more or less crushed against the endocarp; the inner epidermis is represented by a thin sheet of closely adherent cells having lignified inner and radial walls. Outer epidermis and mesophyll layers of tegmen are crushed and persist as a sublignified punctate layer.

#### **Study of the powdered drugs:**

The powder is of a characteristic light yellow colour, slightly acidic in taste and faintly aromatic odour. Microscopic examination of the powder, after clearing with 75% chloral hydrate, reveals that's it contain abundance of fibres, epidermal trichomes, xylem elements and few large thin-walled parenchymal cells<sup>11,2,5,6</sup>.

#### **Maceration:**

Macerates consists of fibres with different types of apices, xylem elements with spiral and scalariform thickenings, thin and thick-walled parenchyma cells, unicellular trichomes, rosettes of calcium oxalate crystals etc.<sup>1,2,3,4,5,6,7,8</sup>.

#### **Measurement of cells (in microns)<sup>2,5,6</sup>.**

Trichome	250x20.5-880x70.5-1560x75.0
Parenchyma cells	32x32-96x96-112x112
Sclerenchyma cells	258x12.5-568x16.6
Xylem elements	100x10.5-160x16.3
Calcium crystal (druses)	16x16-32x30.5

#### **REACTION OF CHEMICALS WITH CRUDE POWDERED DRUG**

<b>Chemical</b>	<b>Observation</b>
Triturated with water	Emulsion formed
Shaked with water	Little froth appears
Pressed between filter papers	No oily stain appears
Heated with sodium hydroxide	No colour change (5%) solution
Heated with sulphuric acid	No colour change (66%) solution
Heated with ferric chloride	No colour change (5%) solution



**Figure: 3: Khar-e-Khasak powder.**

### FLUORESCENCE ANALYSIS OF THE POWDERED DRUG<sup>5,6</sup>.

Treatment	Observation under	
Ordinary light	Ultraviolet light	
Acetone	Greenish yellow	Yellow
Benzene	Greenish yellow	Light green
Chloroform	Light green	Light yellow
Ethanol	Yellow	Yellow
Ethyl acetate	Light green	Yellowish green
Solvent ether	Light yellow	Light yellow
*Water	Dirty yellow	Greenish yellow
*Carbon tetrachloride =	Yellow	

\*Powder tends to float in water and carbon tetrachloride while settles down in rest of the solvents.

#### Chemical constituents:

Fruits contain an alkaloid, fixed and essential oils, resin, mineral matters and some steroidal saponins, pyroketone

ring (diosgenin), gitogenin and hecogenins.

Identity, Purity, strength and assay:

Foreign organic matter	Nil
Purity	100%

#### IDENTITY

##### Physico-chemical constituents (%)

Total ash	11.52
Acid insoluble ash	3.57
Water soluble ash	3.19

**pH values**

1% solution 5.0

10% solution 5.8

**Successive extractive values (%)**

Petroleum ether 4.46

Chloroform 1.04

Alcohol 7.50

**Thin Layer Chromatography:**

The T.L.C. of chloroform extract of powder was carried out using the solvent system chloroform and benzene (4:1). The plates were developed with Iodine vapors. It showed no spot<sup>1,2,3,4,5,6,7,8</sup>.

**Taste:** Slightly acidic<sup>1,2,4,5,6,7</sup>.

**Temperament (Mizaj):-** Hot 1<sup>0</sup>, Dry 1<sup>0</sup><sup>1,2,3,4,5,6,7,8</sup>.

**FUNCTION AND USES AS DESCRIBED IN UNANI LITERATURE:**

Mudir-e- Baul (Diuretic), Mufattit-e- Hisat (Lithotriptic), Litholytic, Lithoexpulsive, Mulayyan (Laxative), Muqawwi-e-Bah (Aphrodisiac), Mussakin-e-alam (Renal Analgesic), Mudirr-e-Haiz, Healing action of Ulcerative Urinary tract, Concoctive, Senenogenic, Cooling, Emollient, Appetizer, Digestive, Expectorant, Anti-inflammatory, Cardio tonic, Styptic, Carminative, Emmenagogue, Detergent, Tonic of penile erection, Deobsturent, Mana-e-Insabab-e-mawad<sup>1,2,3,4,5,6,7,8,9,10,11,12,13,14,15</sup>.

**Therapeutic uses:** It is use in following conditions.

Hisat-e-Kulliyah, Hisat-e-Masana, Hurqat-e-Baul, Ehtabas-e-Haiz, Sur-at-e-Inzal, Jiryān, Cures Strangury, Gleet, Increase the menstrual flow, Cure Gonorrhoea and gleet Calculus affection, Vesicular Calculi, Inflammation of Bladder, Painful micturition, Urinary discharges, Dysuria, Oliguria, Anuria, Menorrhagia, Amenorrhoea, Spermatorrhoea, Anorexia, Dyspepsia, Helminthiasis, Cough, Asthma, Cardiopathy, Haemoptysis, Anaemia, Scabies, General weakness, Leprosy, Epistaxis, Ulcerative Stomatitis, Rheumatoid arthritis. The decoction is useful as a gargle for mouth troubles and painful gums reduce inflammation<sup>1,2,3,4,5,6,7,8,9,10,11,12,13,14,15</sup>.

**Badal (Substitute):** Khar-e-Khasak Kalan (Pedalium murex Linn.) & Kaknaj<sup>1,2,3,4,5,6,7,8,9,10,11,12,13,14,15</sup>.

**Important Murakkabaat (formulation):** In Quarabadeen, there are lots of formulations where Khar-e-Khasak has been used, but the famous formulations are Sharbat-e-Buzuri Moattadil, Safoof Sailanur Reham, Sharbat-e-Mudirr-e-Tams & Ziabetus etc<sup>1,2,3,4,5,6,7,8</sup>.

**Therapeutic uses:** Decoction of fruits is efficacious in dissolving renal and bladder calculi. For impotency it is used in the form of powder or majoon<sup>1,2,3,4,5,6,7,8,9,10,11,12,13,14</sup>.

**Doses:** 3-5 gm. or 3 grams morning & evening with water<sup>1,2,3,4,5,6,7,8,9,10,11,12,13,14,15</sup>.

**Doses form:** Powder in capsule form<sup>1,2,3,4,5,6,7,8</sup>.

**Musleh (Corrective):** Baadam Sheerin (*Prunus amygdalus* Batsch) & Sesamum oil<sup>1,2,3,4,5,6,7,8</sup>.

**Muzir (Harmful Effect):** Harmful for Nervous System (cerebral) diseases<sup>1,2,3,4,5,6,7,8</sup>.

**Controversy:** Two different plants known as Gokhru, Viz. *Tribulus terrestris* linn. and *Pedalium murex* linn. The later is an erect plant with fruits having four spines<sup>1,2,3,4,5,6,7,8</sup>.

#### **VARIOUS AUTHENTIC SCIENTIFIC REPORTS ON KHAR-E-KHASAK**

According to Unani system of medicine, it is diuretic, cures strangury, vesicular calculi, gleet, gonorrhoea, lumbago, and tonic, enriches blood, increases menstrual flow, good gargles for mouth troubles and painful gums, stomachic, appetizer, emmenagogue etc. (Singh and Panda, 2005; Agharkar, 1991)<sup>16,17,18</sup>.

*Tribulus terrestris* and *Pedalium murex* have been reported to be good diuretics (Singh et al., 1991; Sangeetha et al., 1993; Ahmed et al., 1987; Prasad & Sastry, 1987). In earlier studies, *Pedalium murex* and *Areca catechu* have shown 5 $\alpha$ -reductase inhibitory activity. *Caesalpinia bonducella* has been used in the treatment of hydrocele and glandular swelling (Nadakarni, 1982). In the present study, Prostane was evaluated for its 5 $\alpha$ -reductase inhibitory activity and  $\alpha$ -antagonistic activity in vitro, and its activity against experimental prostatic hyperplasia in rats (Mitra et al., 1999)<sup>19,20</sup>.

HPTLC studies on *Tribulus terrestris* L. (Chota Gokhru) and *Pedalium murex* L. showed that qualitative as well as quantitative HPTLC study was undertaken - on fruits of both the plants. Qualitative studies include finger printing studies on flavonoids and saponins. Saponins were reported in *Pedalium murex* for the first time, Quantitative HPTLC studies include estimation of diosgenin. *Tribulus terrestris* was found to contain 0.08% of diosgenin where as *Pedalium murex* was found to contain 0.06% of diosgenin (Mangle and Jolly, 1998)<sup>19,20,21</sup>.

*Tribulus Terrestris*, formulated by world renowned Dr. Ray Sahelian, M.D., author of Natural Sex Boosters Passion Rx, one of the bestselling natural sexual products on the market, is formulated by Dr. Sahelian *Tribulus terrestris* is a tropical vine common in sandy soil throughout India, Pakistan, and Sri Lanka<sup>22</sup>.

**Gauthaman K, Ganesan AP.** Department of Obstetrics & Gynaecology, Yong Loo Lin School of Medicine, National University of Singapore, 5 Lower Kent Ridge Road, 119074 Singapore.

Hormonal effects of *Tribulus terrestris* were evaluated in primates, rabbit and rat to identify its usefulness in the management of erectile dysfunction)<sup>23</sup>.

**In China**, *Tribulus terrestris* is used in a number of conditions affecting the liver and kidney as well as the cardiovascular and immune systems<sup>23</sup>.

**In Turkey**, *Tribulus terrestris* is commonly used in folk medicine for blood pressure and cholesterol. In Europe, *Tribulus* has been used in folk medicine throughout history, as far back as the Greeks, for wide-ranging conditions as headache, nervous disorders, constipation, and sexual dysfunction<sup>23</sup>. The role of *Tribulus terrestris* in eastern European folk medicine for muscle strength and sexual potency led to two decades of formal (though secret) government-sponsored studies. The preventive and therapeutic effects of saponins from *Tribulus terrestris* on diet-induced hyperlipidemia in mice have been studied. It showed that in preventive experiment the *Tribulus terrestris* saponin could significantly lower the levels of serum total cholesterol and triglyceride<sup>23</sup>.

**Exp. Biol. Med (Maywood)**. 2007 Jan; 232(1):126-33. Medical University, Sofia 1431, Bulgaria  
The objective of the study was to explore the influence of saponin derived from *Tribulus terrestris* on normal human skin fibroblasts and to compare it with their anticancer properties<sup>179</sup>. Saponins from *Tribulus terrestris* Linn. are less toxic for normal human fibroblasts than for many cancer lines: influence on a apoptosis and proliferation<sup>22</sup>.

Antifungal activities and action mechanisms of compounds from *Tribulus terrestris* L. J Ethnopharmacol. 2005 Sep 14; Antifungal activity of natural products is being studied widely. *Tribulus terrestris* has significant in vitro and in vivo antifungal activity, weakening the virulence of *Candida albicans* and killing fungi through destroying the cell membrane<sup>23</sup>.

In Southern India, the fruit is highly valued as a diuretic. In many cases where this has been tried, the result was quite perceptible in the increase of the secretion. There is a method of administration, in which the fruit and the root are with rice to form medical water, which is taken in large quantities<sup>23</sup>.

Aphrodisiac properties of *Tribulus Terrestris* extract (Protodioscin) in normal and castrated rats<sup>24</sup>. Aphrodisiac and Libido Enhancer: *Tribulus terrestris* L. (Zygophyllaceae) have been used as an aphrodisiac agent in both; the Indian and Chinese traditional systems of medicine. Administration of *Tribulus terrestris* extract showed increased sexual behavior and intracavernous pressure both in normal and castrated mice and these effects were probably due to the androgen increasing property of the herb<sup>24</sup>. The findings from the present study add further support to the aphrodisiac claims of the herb. (Effect of *Tribulus terrestris* on nicotinamide

adenine dinucleotide phosphate-diaphorase activity and androgen receptors in rat brain in J. Ethnopharmacol. 2005 Jan 4; 96(1-2):127-32.) Renal Carcinoma: To investigate the effect of saponins from *Tribulus terrestris* on the renal carcinoma cell (786-0) in vitro and inhibitory mechanisms<sup>26</sup>.

*Tribulus Terrestris* is a natural herb used for its medicinal effects around the world<sup>25</sup>. The effects of *Tribulus terrestris* on body composition and exercise performance in resistance-trained males. Antonio J, Uelmen J, Rodriguez R, Earnest C. Human Performance Laboratory, University of Nebraska, Kearney, NE 68849-3101, USA has quoted. We all know testosterone helps build muscle and strength, that's why some pro athletes use steroids and other prohormones to enhance performance. You'll be happy to hear that *Tribulus Terrestris* is NOT a hormone! It works completely different from Andro and DHEA. *Tribulus* increases testosterone through increasing luteinizing hormone (LH) in your body<sup>25</sup>.

Chronic treatment of *Tribulus terrestris* in rats increases the NADPH-d positive neurons and AR immunoreactivity in the PVN region. Androgens are known to increase both AR and NADPH-d positive neurons either directly or by its conversion to estrogen. The mechanism for the observed increase in AR and NADPH-d positive neurons in the present study is probably due to the androgen enhancing property of *Tribulus terrestris*<sup>26</sup>. In some study in laboratory, cells found in saponins from *Tribulus terrestris* inhibited the growth of a particular type of liver cancer cell line<sup>26</sup>.

**In China and India**, the herb *Tribulus terrestris* has been touted as liver, kidney, urinary, and cardiovascular remedies<sup>26</sup>. Group I was treated with distilled water and Group II was treated with *Tribulus terrestris* at the dose of 5mg/kg body weight orally, once daily for 8 weeks<sup>26</sup>. The brain tissue was removed and sections of the paraventricular (PVN) area of hypothalamus were taken for NADPH-d and AR immunostaining. There was an increase in both NADPH-ds (67%) and AR immunoreactivity (58%)<sup>26</sup>. *Tribulus terrestris* can also lower cholesterol levels in bloodstream, and, in addition, *Tribulus* also have potential antioxidant properties. *Tribulus terrestris* - heart and immune support *Tribulus terrestris* has been studied in China and found to decrease the frequency of angina pectoris<sup>26</sup>.

Phytochemistry, 2007 Aug 22; Dinchev D, Janda B, Evstatieva L, Oleszek W, Aslani MR, Kostova I. Institute of Organic Chemistry with Centre of Phytochemistry, Bulgarian Academy of Sciences, Sofia 1113, Bulgaria. The steroidal saponins of *Tribulus terrestris* L. (*Zygophyllaceae*) are considered to be the factor responsible for biological activity of products derived from this plant<sup>22</sup>. Human research has established that *Tribulus Terrestris* is safe and free of side-effects<sup>25</sup>.

## CONCLUSION

In this research article authors tried hard to collect & synchronise all the relevant and available matter and research on research drug i.e., Khar-e-Khasak (*Tribulus terrestris* Linn.). This is one of the important drugs of urinary system and it requires further extensive research so as its applicability in Nephrolithiasis may be maximize and generalized. And it happens it would be the cost effective, easily available and non invasive option for said problem.

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<http://www.ayurvediccure.com/tribulus-terrestris.htm>- [cited on dated,10-05-2011.]



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