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ABSTRACT :

Gokshura (Tribulus terrestris Linn.) Family: Zygophyllaceae is a procumbent herb commonly known as Small Caltrops, occurs naturally throughout India, specially warm regions. As this is having *Guru*, *Snigdha Guna*, *Madhura Rasa*, *Madhura Vipaka*, *Shita Virya*. By the virtue of above property this is *Vatapittashamaka*. *Gokshura* contains a number of bioactive chemicals, including saponins, flavonoids, glycosides, alkaloids, and tannins. The fruits of *Laghu Gokshura* (*Tribulus terrestris Linn.*) are useful as alterative, aphrodisiac, anthelmintic, anti-arthritis, cooling, tonic, demulcent, expectorant and contraceptive (root of white flower-variety). It is useful as calculus affections, kidney diseases, painful micturition and urinary discharges. The present review is therefore, an effort to give a detailed focus on its botanical details, phytochemistry, pharmacodynamics, therapeutic importance and its pharmacological studies.

Keywords : *Gokshura*, *Tribulus terrestris*, diuretic, *ashmari*, phytochemistry, pharmacology.

INTRODUCTION: *Gokshura (Tribulus terrestris Linn.)* Family: Zygophyllaceae is a procumbent herb commonly known as Small Caltrops, occurs naturally throughout India, specially warm regions. (Fig. 1). The fruits of *Laghu Gokshura* are useful as alterative,

aphrodisiac, anthelmintic, anti-arthritis, cooling, tonic, demulcent, expectorant and contraceptive (root of white flower-variety). It is useful as calculus affections, kidney diseases, painful micturition and urinary discharges.



Figure 1 *T.terrestris*. (A) Whole plant with flowering twig. (B)Fruit.

History: On comprehensive review of Ayurvedic classics it was found that *Gokshura* is described in *Charaka Samhita*, *Sushruta Samhita*, *Ashtanga Hridaya*, *Sharangadhara Samhita*, *Harita Samhita*, *Nighantu* and *Chikitsagranthas*. In *Charaka Samhita*, it is described as *Shvadanshtra ghrita* used in *ashmari* (C.Ci.26.74). In *Sushruta Samhita*, it is

described in *mutrakrichchhra* (S.U.59.19). In *Ashtanga Hridaya*, it is described as *Rasayana* (A.H.U.39.56). In *Harita Samhita*, it is described as *ashmarihara* (H.S.3.31-13). In *Kaideva Nighantu*, it is described as *Hridaroga*, *krichchhashmari*, *shvasakasarujahara*.¹ In *Bhavaprakasha Nighantu*, its properties are described as *vrishya*, *ashmarihara*,

*pramehashvasakasarsha, hridroga.*² In *Raj Nighantu*, *gokshuradvaya* is described in *krichchhrashmari*.³ It is also mentioned in *Chikitsa Granthas* like *Chakradatta*, it is described as sunthigokshura kwatha in *amavata* (CD.25.9.). *Bhavamishra*, in his section *Bhavaprakash, madhyamakhanda* mentions indication of *trikantakabeejachurna* in *ashmari*.⁴ Same used in *Vrindamadhva* (VM.34.28). *shvadanshtraphalachurna* is used in *shosharoga*(Rajamartanda.12.3).

Botanical classification⁵

Tribulus terrestris Linn. belongs to the family *Zygophyllaceae*.

Kingdom: Planate

Unranked: Angiosperms

Unranked: Eudicots

Unranked: Rosids

Order: Zygophyllales

Family: Zygophyllaceae

Genus: *Tribulus*

Species: *terrestris*

Part used: Fruits, roots, whole plant.

Doses of fruit powder 3-6gm., Decoction 50-100 ml. Specific formulations are *Goksuradi curna*, *Goksuradyavaleha*, *Goksuradi guggulu*, *Goksuradi Kvatha*, *Dasamularista*, *Trikantakadya* (*Sadhita*) *Ksira*, *Trikantakadi Kvatha*, *Svadanstra taila*, *Goksuradi modakam*, *Svadanstra ghrtam*, *Abhayarista*, *Svadanstradi pamakam*, *Svadanstradi Kasayam*, *Trikantakabija curnam*, *Brhat Varunadi Kvatha*.

Vernacular Names⁶

Sanskrit names : Gokshura, Kshuraka, Kantaphala, Gokantaka, Trikantaka, Bhakshakanta, Bhukshura, Shvadanshtra, Svadukantaka, Palankasha- Fruits are armed with spines which injure the feet of grazing cattle.

Ikshugandhika- With aroma of sugarcane. Sthalashringataka, Vanashrigataka- Fruits resembling water-chestnut.

Shadanga- It possesses the sixth part, spines, apart from usual five parts.

Chanadruma- The plant has leaves like those of Bengal gram plant.

Hindi, Bengali, Marathi, Punjabi : Gokhru, Hathchikar

Mar. : Sarate

Guj. : Beta gokhru, Mhana Gokhru

Tamil : Nerunje

Telugu : Palleru

Pers. : Kharakhasak

Arab. : Hasak

Eng. : Small Caltrops, Gokhru

Description⁷

A. *Tribulus terrestris Linn.* :Goksura-ksudra goksura

A procumbent herb; stems and branches pilose; young parts silky-villous. Leaves opposite, abruptly pinnate, one of each pair usually smaller than the other; sometimes wanting; stipules lanceolate, hairy; leaflets 3-6 pairs, 6-12 mm. long, oblong, mucronate, sericeous-villous with appressed hairs beneath and more or less so on the upper surfaces, base rounded oblique; petioles very short pilose.

Flowers axillary or leaf-opposed, solitary; pedicels 1.2-2 cm. long, slender, hairy. Sepals 6 mm., lanceolate, acute, hairy. Petals 1 cm., long, oblong-ovate; claw short, hairy. Ovary bristly; style short; stout; stigmatic lobes longer than the diameter of the style.

Fruit globose, consisting of (usually) 5 hairy or nearly glabrous, often muriculate, woody cocci, each with 2 pairs of hard sharp spines, one pair longer than the other. Seeds several in each coccus, with transverse partitions between them.

Flowering and Fruiting Time is rainy to autumn seasons and onwards.

It is found throughout India, especially warm regions.

B. *Pedalium murex Linn.* : Brhad goksura.

Family : Pedaliaceae

Description: A much-branched herb, 15-38 cm. high; stems and branches often slightly rough with scaly glands.

Leaves opposite, pale glaucous-green, somewhat fleshy, 2.5-5 by 2-3.8 cm. broadly ovate-oblong, truncate or obtuse, coarsely crenate-serrate or sublobate, glabrous above, the lower side usually covered with minute scales, base acute; petioles 6-20 mm. long.

Flowers axillary, solitary; pedicels 4 mm. long. Calyx small, scarcely 3 mm. long; minutely scaly outside, divided rather more than half way down; lobes 5, linear-triangular, acute. Corolla 2.5 cm. long, about 2 cm. across the mouth, bright yellow; tube 2 cm; long, slender; lobes broad, rounded. Filaments glandular-hairy at the base.

Fruit 1.3-2 cm., long, narrowed at the base, pyramidal-ovoid above the spines, bluntly 4-angled, with stout sharp conical horizontal spines from the angles.

Flowering and Fruiting Time rains to autumn seasons and onwards.

It is found in tropical regions in India; Konkan, Gujarat, Madhya pradesh, Uttar Pradesh, Deccan Peninsula and other areas in country.

Pharmacodynamics⁸

Rasa: Madhura

Guna: Guru, Snigdha

Virya: Shita

Vipaka : Madhura

Doshakarma : Vata pittashamaka

Chemical composition

The preliminary phytochemical study of TT revealed the presence of saponins, flavonoids, glycosides, alkaloids, and tannins.^[6]⁹ Tian Shung *et al.* isolated and characterized three new compounds, terrestrisamide, 25R-spirost-4-en-3, 12-dione, and tribulusterine, together with 10

known compounds, *N*-*p*-coumaroyltyramine, terrestriamide, hecogenin, aurantiamide acetate, xanthosine, fatty acid ester, ferulic acid, vanillin, *p*-hydroxybenzoic acid, and β -sitosterol, from the dried fruits of TT.^[16]¹⁰ The alkaloids present are harmane and norharmane. The β -carboline alkaloid, tribulusterine, is present in minor quantities in fruits.^[17]¹¹ Gas chromatography-mass spectrometry analysis of methanolic extract of the whole plant of TT revealed the presence of α -Amyrin as the major constituent and seven minor constituents, which are 3,7,11,15-tetramethyl-2-hexadecen-1-ol, *n*-hexadecadienoic acid, hexadecadienoic acid ethyl ester, phytol, 9,12-octadecadienoic acid, 9,12,15-octadecatrienoic acid, and 1,2-benzenedicarboxylic acid disoctyl ester. Sterols such as β -sitosterols and stigmasterols were also found to be present.^[18]¹²

Therapeutic uses¹³ The medicinal properties of Brhad Goksura (Pedalium murex Linn.) are almost the same as those of Laghu Goksura (*Tribulus terrestris* Linn.)

The fresh leaves and stems, briskly agitated in cold water, speedily convert it into a thick mucilage, nearly of the consistence of the white of a raw egg, inodorous and tasteless.

An infusion of fresh leaves and stems is used as an esteemed remedy for treating gonorrhoea and dysuria.

The juice of the fruits is useful as an emmenagogue. It is employed in puerperal diseases, and to promote the local discharge. The leaves are used as a curry in spleenic enlargements. The decoction of the roots is used as an antibilious remedy.

It is very useful drug in kidney and urinary troubles specially calculus and dysuria and their allied complications. The fruits are antispasmodic, aphrodisiac and emmenagogue; their decoction is used for the diseases for which the mucilaginous infusion of the leaves is suggested. The juice of the fruits is given in puerperal diseases, and for promoting lochial discharge. A pint of an infusion of the seeds is given daily in spermatorrhoea, impotence and incontinence of urine.

Pharmacological Properties

Diuretic activity: Saurabh *et al.* evaluated the different extracts of TT fruits, viz. aqueous, methanolic, *Kwatha*-high strength, *Kwatha* -low strength, and *Ghana* powder, for diuretic activity in rats. [21]¹⁴ The diuretic action of TT makes it useful as an anti-hypertensive agent.

Aphrodisiac activity

Adaikan *et al.* reported that the TT extract exhibited a pro-erectile effect on rabbit corpus cavernosum smooth muscle *ex vivo* after oral treatment at doses of 2.5, 5, and 10 mg/kg body weight for 8 weeks. [22]¹⁵

Antiulithic activity

An ethanolic extract of TT fruits was tested in urolithiasis induced by glass bead implantation in albino rats by Anand *et al.* [27]¹⁶

Immunomodulatory activity

An alcoholic extract of the whole plant of TT exhibited a significant dose-dependent increase in humoral antibody titre and delayed type hypersensitivity response, indicating increased specific immune response. [31]¹⁷

Antidiabetic activity

Saponin from TT possesses hypoglycemic properties. [32]¹⁸

Hypolipidemic activity

The aqueous extract of the fruits of TT was evaluated for their hypolipidemic activity in Wistar albino rats. [37]¹⁹

Activity in cardiac disorders

TT showed significant effect in the treatment of various cardiac diseases including coronary disease, myocardial infarction, cerebral arteriosclerosis, and the sequelae of cerebral thrombosis. [40]²⁰

Central nervous system (CNS) activity

Swiss Albino mice demonstrated antidepressant and anxiolytic activity. [43]²¹

Hepatoprotective activity

The TT extract (250 mg/kg) showed a remarkable hepatoprotective activity against acetaminophen-induced hepatotoxicity in *Oreochromis mossambicus* fish. [44]²²

Antiinflammatory activity

The methanolic extract of TT showed a dose-dependent inhibition of rat paw volume in carrageenan-induced inflammation in rats. [46]²³

Analgesic activities

Analgesic activities of TT were studied in male mice using formalin and tail flick test. [47]²⁴

Antispasmodic activity

The lyophilized saponin mixture of the plant exhibited a significant decrease in peristaltic movements of rabbit jejunum preparation in a dose-dependent manner. [48]²⁵

CONCLUSION: On comprehensive review of Ayurvedic classics it was found that *Gokshura* is described in *Charaka Samhita*, *Sushruta Samhita*, *Ashtanga Hridaya*, *Sharangadhara Samhita*, *Harita Samhita*, *Nighantus* and *Chikitsagranthas*. Some synonyms of *gokshura* like

Gokshura, Kshuraka, Kantaphala, Gokantaka, Trikantaka, Bhakshakanta, Bhukshura, Shvadanshtra, Svatukantaka, Palankasha described in various *Nighantu*. *Gokshura* (*Tribulus terrestris Linn*) Family: Zygophyllaceae is a procumbent herb commonly known as Small Caltrops, occurs naturally throughout India, especially warm regions. As this is having *Guru, Snigdha Guna, Madhura Rasa, Madhura Vipaka, Shita Virya*. By the virtue of above property this is *Vatapittashamaka*. The fruits are considered demulcent and diuretic, antispasmodic and aphrodisiac. The juice is used in aphthae as a local application. The decoction is useful in irritation of the urinary organs; it is given as a remedy for sperma-torrhoea, incontinence of urine and impotency.

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