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Chapter 1

A review on Tribulus terrestris: Insights into its medicinal properties and applications

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Abstract: *Tribulus terrestris (Zygophyllaceae)*, commonly referred to as puncture vine or gokshura, is a medicinal plant well-known for its numerous therapeutic applications and bioactive phytochemical profiles. This plant which has traditionally been utilized in Ayurveda, Traditional Chinese Medicine and other folk medical systems, has a wide range of pharmacological qualities including aphrodisiac, anti-inflammatory, diuretic, antioxidant and antibacterial effects. These qualities are mostly due to its high concentration of saponins, flavonoids, alkaloids and other secondary metabolites. Recent advances in phytochemical and pharmacological research have emphasized its potential for treating problems such as urolithiasis, sexual dysfunction, cardiovascular disease and metabolic disorders.

Keywords: Tribulus terrestris, Medicinal plant, Zygophyllaceae.

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1.1. Introduction

Tribulus terrestris is an herb that is often known as Gokhru and is a member of the *Zygophyllaceae* family. It is widespread throughout India (Stefanescu *et al*. 2020). The whole plant is used medicinally, although the fruits and roots are utilized more often. *Tribulus terrestris* is utilized in China for a variety of ailments pertaining to the kidney, liver and immunological system in addition to the cardiovascular system. Its anti-

urolithiatic, diuretic and aphrodisiac qualities are well-known in Ayurveda. In addition to increasing menstrual flow and curing gonorrhea, leaves are diuretic and tonic. Due to its diuretic properties, the fruit gets rid of bladder stones and gravel in the urine. The root makes a tasty appetizer or stomachic. There have been reports of many steroidal saponins, alkaloids, furostanal glycosides and flavanoids. Research from various sources, such reports, books, PubMed, Science Direct, Wiley, Springer as well as other databases has shown that its potent bioactive components have the potential to heal a variety of maladies in humans and animals. Our review distinguishes itself from other published publications by focusing on the significance of this topic for human and veterinary health. It has potential as an aphrodisiac for treating reproductive issues in both humans and animals (Saeed *et al*. 2024). More research is needed to understand the medicinal properties of herbs like *T. terrestris*, allowing for their application in a larger range of nutraceutical products for humans.

1.2. Habitat

According to Vaidya Gogte and Vishnu Mahadev (2012) *T. terrestris* found all throughout India, particularly in the north and south.

1.3. Botanical Description

According to Semerdjieva and Zheljazkov (2019) *Tribulus terrestris* is a small herb with a height of 2 to 3 feet. Branches spread from all sides. Leaves are Similar to those of a gram plant. Flowers are small, yellow, with five petals. Fruits were lightly pentagonal, with 2-3 sharp thorns. Many seeds contain fragrant oils. Roots are 10-13 cm long, smokey with a little strong fragrance, and sweet. Flowering happens in the autumn, followed by fruits. The root consists of cylindrical, fibrous, and frequently branching parts measuring 7-18 cm in length fracture fibrous, aromatic odor, sweetish and astringent flavor. A transverse cut of the primary root reveals a layer of epidermis followed by 4-5 layers of thin-walled parenchymatous cortex. Endodermis is separate, with a pericycle encircling the diarchy stele. In mature root have 4-6 layers of cork, a single layer of cork cambium and 6-14 layers of thin-walled parenchymatous cells with varied fiber distribution. The xylem parenchyma has simple pits, reticulate thickening, and few fibers. Secondary cortex, phloem, and medullar ray cells contain starch grains and calcium oxalate rosette crystals, whereas xylem ray cells also have a few prismatic crystals. Fruit is stalked and globose, with fire-woody wedge-shaped cocci and two pairs of short spines (one larger

than the other). Microscopically, the pericarp is divided into epicarp, mesocarp, and endocarp. Non glandular trichomes cover the outside surface of the epicarp. The endocarp consists of 3-4 layers of sclerenchymatous cells and prismatic calcium oxalate crystals. Vessels have simple pits and some exhibit helical thickening. Fibers are lignified and linear, with tapering ends. Parts used include fruit, root and pentad (Database on Medicinal Plants used in Ayurved, 2005).

1.4. Chemical constituents

Fruits include chlorogenin, diosgenin, gitogenin, rutin, and rhamnose. Roots contain champesterol, sitosterol, stigmasterol, diosgenin and neotrigogenin. Aerial Parts contains Astragalin, dioscin, diosgenin, hecogenin, ruscogenin, furostanol, glycosides, saponin terrestrosides, etc.

Cultivation

The herb is a popular necessity and grows quickly after the first showers. It favors medium and sandy soils. The plant can be reproduced using seeds. It produces blooms and fruits virtually all year.

Contraindications

According to Sabnis (2006) *Tribulus terrestris Linn* is considered quite safe, with no known contraindications.

Drug interaction

There have been no recorded medication interactions between *Tribulus terrestris* and any synthetic or plant-based drug.

1.5. Therapeutic Applications of Gokshura

It has been demonstrated that Gokshura possesses anthelmintic, antifungal and antibacterial activity against both Gram-positive and Gram-negative bacteria (Kiran 2011; Deepak *et al*. 2002; Mojdeh *et al*. 2014). According to Mohammed (2008) *T. terrestris* possesses anti-urolithiasis action (Choy *et al*. 2019), aphrodisiac activity (Saurabh *et al*. 2012), anti-inflammatory activity (Rajendar *et al*. 2011) diuretic (Oh *et al*. 2012; Mahboubi (2022), Neuroprotective effect (Wang *et al*. 2019), anti-hyperlipidemic (chu *et*

al. 2003), Hepatoprotective activity (Arain *et al*. 2022), anti-tumor (Saurabh *et al*. 2012), hypotensive (Phillips *et al*. 2006), anti-diabetic activity (Lamba *et al*. 2012), antispasmodic activity (Arcasoy *et al*. 1998), cardiotonic activity (Kim *et al*. 2011), immune-suppressive (Tiwari 2011), Anthelmintic (Ahmed *et al*. 2020), Antioxidant (Bhuvad 2016). The empirical application indicated in Ayurveda has been validated in scientific platforms as demonstrated in the same way as scientific verification in clinical instances has done so; dysfunctional sexual behavior in women (Akhtari 2014), Gonadal late-onset erectile dysfunction, hypoglycemia, hypolipidemia and hypofunction symptoms of the lower urinary tract in women

Fig.1. Medicinal importance of Tribulus terrestris

with diabetes (Arcasoy *et al*. 1998) benign hyperplasia of the prostate (Bhalodia *et al*. 2012). Diabetes-related microalbuminuria (Fatima and Sultana 2017) renal stones (Ramkete 2012) menopausal transition symptoms (Rahman 2017).

1.6. Conclusion

Medicinal plants are essential components of Indian medicinal systems and serve as a source for drug development. In such a way *T. terrestris* may be an effective source because it has varied bioactive chemicals in its plant parts. *T. terrestris* has been utilized for generations in the Unani School of medicine. It has been used to treat many sexual disorders. *T. terrestris* has long been utilized in traditional medicine as a rheumatic pain reliever and analgesic herb. This comprehensive review covers *T. terrestris*

phytochemistry, pharmacology, benefits and medicinal applications. *T. terrestris* plant has been extensively studied for its phytochemical and pharmacological properties including diuretic, anti-urolithiasis, anti-hypertensive, a pain reliever anti-hyperlipidemic, immunomodulatory, hypoglycemic, chemotherapy, anti-helminthic, aphrodisiac, antibacterial, liver-protective properties and anti-inflammatory properties. This herb's population is diminishing in the wild. Therefore, cultivation and conservation efforts should be supported and also further research is needed to understand its biological and molecular mechanisms.

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