Plants have a significant role in preserving human health and improving quality of life. Gokshura (Tribulus terrestris Linn.) one of such plants, is mentioned in Ayurvedic texts for various therapeutic properties like balya(strengthening), brimhana (nutritive), rasayana (rejuvenator), moortrala (diuretic), shothahara (anti-inflammatory), vajikarana (aphrodisiac) etc. and useful in the management of mutrakrichra (dysuria), ashmari (renal calculi) etc. It is a perennial plant, grown predominantly in India and Africa. Its extract contains alkaloids, saponins, resins, flavanoids and nitrates. As its therapeutic value is highlighted to be a vajikara dravya (aphrodisiac). 4 Studies reported that, furastanolic type of saponin present in T. terrestris increases the amount of luteinizing hormone (LH), motivate spermatogenesis and results in motivation of Testosterone. These activities may help in civilizing the quality and quantity of sperm significantly. 5 Furostanol saponin extract from T. terrestris shows positive effect on spermatogenesis of rats during breeding season with increase in count of spermatozoids, time of viability and sperm motility. 6

**Pharmacogosy**

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**Aphrodisiac activity:**

Ethanol extract of fruits of Tribulus terrestris displayed significant dose dependent protection against uroliths induced by glass bead implantation in albino rats. 8

**Effect on hypertension:**

Decreased systolic blood pressure was reported with the treatment of lyophilized aqueous extract of tribulus fruits. 9 Gokshura ghana (solid aqueous extract) is reported to be used in mild to temperate essential hypertension. 10

**Anti-hyperlipidemic effect:**

Methanolic extract of Tribulus terrestris show hypolipidemic effect. 11 Saponins of Tribulus terrestris were found to significantly lower serum total cholesterol, low density lipoprotein cholesterol and liver total cholesterol, triglycerides in diet-induced hyperlipidemia in mice. 12

**Effect on diabetes mellitus:**

Levels of malondialdehyde (MDA) and significant recovery of liver was found in treated rats. 13 T. terrestris methanolic extract caused a significant decrease in blood glucose level and glycosylated haemoglobin. 12 In another study, methanolic extract of T. terrestris showed significant decrease in blood sugar level 7
Cardio-protective effect:

Hydro-alcoholic lyophilized extract of whole plant of *Tribulus terrestris* has been reported to have cardio-protective function. The fraction is reported to attenuate myocardial infarction in rats.14

Analgesic effect:

Methanolic extract of fruits reported to have analgesic activity. The extract also found to have smaller gastric ulcerogenic activity as compared to Indomethacin.15

Antispasmodic activity:

Significant decrease was found in peristaltic movement of sheep ureter and rabbit jejunum when treated with lyophilized saponin extract of dried and powdered *Tribulus terrestris*.16

Anti-microbial activity:

Spiroponin, ethnic folk of the fruit and leaves of *Tribulus terrestris* has activity against E. coli and S. aureus.17 Hexanoic and methanolic extracts of the plant showed significant activity against bacteria like E. coli, Ps. aeruginosa, Klebsiella pneumoniae, Proteus vulgaris and Staphylococcus aureus.8 *Tribulicosin* isdsitoster glycocides present in 50% methanolic extract of *T. terrestris* reported to possess anti-helminthic properties.17 Steroidal saponins from *T. terrestris* Linn. have antifungal action again stfluconazole-resistant fungi (Candida albicans, Candida glabrata, Candida parapsilosis, Candida tropicalis, Candida krusei, and Cryptococcus neoformans).18

Cytotoxic effect:

*T. terrestris* of different regions (Bulgaria, China and India) and different parts of plants (stem and fruit) shows that only the spiro compounds exhibit remarkable activity. The inhibitory effect of saponin mixture from Chinese origin on Bcap37 breast cancer cell has potent inhibitory effect.19 In another study, data showed that Tribulis terrestris aqueous extract blocks proliferation and induces apoptosis in human liver cancer cells through the inhibition of NF_B signalling and can be used as an anticancer drug for hepatocellular carcinoma patients.20 Total extract of the Bulgarian *T. terrestris* has a marked dose-dependent inhibitory effect on viability of breast cancer cells whereas saponin fraction has increased inhibitory effect compared to the total extract. Morphological changes and DNA fragmentation were observed as markers for early and late apoptosis in tumor cells after treatment. In the mechanisms of antitumor activity of *T. terrestris* apoptotic processes are involved. Apoptotic processes showed selective antitumor activity of Bulgarian *Tribulus terrestris* Linn. on human cancer cells in vitro.21

Wound healing action:

The leaves of *Tribulus terrestris* are used traditionally in foldore for the treatment of various kinds of wounds. Aqueous extract in carbopol at 2.5% and 5% concentrations showed significant reduction in period of epithelisation and wound contraction by 50% in excision and burn wound models. In the incision wound model a significant increase in the breaking strength was observed.22

Nutritional values:

*Tribulus terrestris* is found to be rich source of calcium.23

Contraindications:

Use of drug is contraindicated in dehydration and pregnancy.24

References:

1 Sharma PC, Yelne MB, Dennis TJ. Database on Medicinal plants used in Ayurveda and Sidha. New Delhi: CCRAS, Dept. of AYUSH, Ministry of Health and Family Welfare, Govt. of India; vol 3. 2000. p.229.
2 Parker KF. An Illustrated Guide to Arizona Weeds. Tucson (AZ):The University of Arizona Press. 1972. p.338.
3 Pathak, PS. Contributions to the ecology of Tribulus terrestris Linn. II. Habitat studies, Agra University Journal of Research Science 1970; 19(2):149-166.
4 Dhanvantari. Dhanvantari Nighantu. Sharma PV, Sharma GP, editor, reprint edition. Varanasi: Chaukhambha Orientalia, 2008, p. 34.
5 Abbas A. Al-Amery MA, AH, Al-Mosowy AAH, Abbas AH. Study the biological activities of Tribulus terrestris extracts . Journal of Biotechnology Research Center 2010; 4(1):55-60.
6 Kistanova E, Zlatev H, Karcheva V, Kolev A.Effect of plant Tribulus terrestris extract on reproductive performances of rams. Biotechnology in Animal Husbandry, 2005; 21 (1-2):55-63.
7 Ukan MD, Nanavati DD, Mehta NK. A Review on the Ayurvedic herb Tribulus terrestris L. Ancient Science of Life 1997; 17(2):144-150. PubMed PMID: 22556836.
8 Anand R, Patnaik GK, Kalshreshtha DK. Dhawan BN. Activity of certain fractions of Tribulus terrestris fruits against experimentally induced urolithiasis in rats, Indian journal of experimental biology. Indian J Exp Biol 1994; 32(8):548-552. PubMed PMID: 7959935.
9 Sharifi AM, Radbod Darabi, Nasrin Akbarlo. Study of antihypertensive mechanism of Tribulus terrestris in 2K1C hypertensive rats. Role of tissue ACE activity, Life science 2003; 73(2003):2963-2970. PubMed PMID: 14519445.
10 Murthy AR, Dubey SD, Tripathi K. Anti-hypertensive effect of Gokshura (Tribulus terrestris Linn.) A clinical study. Ancient Science of Life 2000; XIX(3-4):139-145.
11 EI-Tantawy WH, Hassain LA. Hypoglycemic and hypolipidemic effects of alcoholic extracts of Tribulus alatus in streptozotocin-induced diabetic rats: A comparative study with T. terrestris, Indian journal of experimental biology 2007; 45:785-90.
12 Shudi C, Weijing Q, Xufeng P, Bin S, Huang Xiaoqing. Effect of Saponin from Tribulus terrestris on Hyperlipidemia. Journal of Chinese Medicinal Material 2003; 26(5):2003-S. PubMed PMID: 14535016.
13 Amin AMR, Mohamed Lotfy, Mohamed Shafullah, Ernest ade, The Protective Effect of Tribulus terrestris in Diabetes. Annals of the New York Academy of Sciences 2006; 1084(2006):391-40. PubMed PMID: 17151317. doi: 10.1196/annals.1372.005.
14 Ojha SK, Nandave M, Arora S, Narang N, Dinda AK, Arya DS. Chronic Administration of Tribulius terrestris Linn. extracts im proves cardiac function and Attenuates Myocardial Infarction in Rats, International Journal of Pharmacology 2008; 4(1):1-10.
15 Heidari MR, Mehrabani M, Pardakhty A, Khazaeli P, Zahedi MJ, Mosowy AAH, Abbas AH. Study the biological activities of Tribulus terrestris extracts . Journal of Biotechnology Research Center 2010; 4(1):55-60.
16 Kistanova E, Zlatev H, Karcheva V, Kolev A.Effect of plant Tribulus terrestris extract on reproductive performances of rams. Biotechnology in Animal Husbandry, 2005; 21 (1-2):55-63.
17 Ukan MD, Nanavati DD, Mehta NK. A Review on the Ayurvedic herb Tribulus terrestris L. Ancient Science of Life 1997; 17(2):144-150. PubMed PMID: 22556836.
18 Anand R, Patnaik GK, Kalshreshtha DK. Dhawan BN. Activity of certain fractions of Tribulus terrestris fruits against experimentally induced urolithiasis in rats, Indian journal of experimental biology. Indian J Exp Biol 1994; 32(8):548-552. PubMed PMID: 7959935.
19 Sharifi AM, Radbod Darabi, Nasrin Akbarlo. Study of antihypertensive mechanism of Tribulus terrestris in 2K1C hypertensive rats. Role of tissue ACE activity, Life science 2003; 73(2003):2963-2970. PubMed PMID: 14519445.
20 Murthy AR, Dubey SD, Tripathi K. Anti-hypertensive effect of Gokshura (Tribulus terrestris Linn.) A clinical study. Ancient Science of Life 2000; XIX(3-4):139-145.
21 EI-Tantawy WH, Hassain LA. Hypoglycemic and hypolipidemic effects of alcoholic extracts of Tribulus alatus in streptozotocin-induced diabetic rats: A comparative study with T. terrestris, Indian journal of experimental biology 2007; 45:785-90.
22 Shudi C, Weijing Q, Xufeng P, Bin S, Huang Xiaoqing. Effect of Saponin from Tribulus terrestris on Hyperlipidemia. Journal of Chinese Medicinal Material 2003; 26(5):2003-S. PubMed PMID: 14535016.
Tribulus terrestris L. with Potent Activity against Fluconazole-Resistant Fungal. Biol. Pharm. Bull. 2005; 28(12):2211-5. PubMed PMID: 16327151.

19. Sun B, Qu W, Bai Z. The inhibitory effect of saponins from Tribulus terrestris on BCap-37 breast cancer cell line in vitro. Zhong Yao Cai 2003; 26(2):104-106. PubMed PMID: 12795220.

20. Kim HJ, Kim JC, Min J, Kim MJ, Kim JA, Kor MH, et al. Aqueous extract of Tribulus terrestris Linn. induces cell growth arrest and apoptosis by down-regulating NF-kB signaling in liver cancer cells, Journal of Ethnopharmacology, 2011;136(1):197-203. doi: 10.1016/j.jep.2011.04.060.

21. Angelova S, Gospodinova Z, Krasteva M, Antov G, Lozanov V, Markov T, et al. Antitumor activity of Bulgarian herb Tribulus terrestris L. on human breast cancer cells, J BioSci Biotech 2013; 2(1):25-32.

22. Wesley JJ, Christina AJM, Chidambaranathan N, Ravikumar K. Wound healing activity of the leaves of Tribulus terrestris (Linn.) aqueous extract in rats, Journal of Pharmacy Research 2009; 2(5):941-3.

23. Duhan A, Chauhan BM, Punia D. Nutritional value of some non-conventional plant foods of India. Plant Foods Hum Nutr. Jul 1992; 42(3):193-200.

24. Frawley D, Lad V. The Yoga Of Herbs: An Ayurvedic Guide to Herbal Medicine. Santa Fe:Lotus Press; 1986. p.169.

25. Bensky D, Gamble A. Chinese Herbal Medicine Materia Medica, revised editionSeattle: Eastland Press;1993. p.42.