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Gokhru *(Tribulus terrestris* Linn.): Pharmacological actions and therapeutic applications: A Review

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Abstract
Gokhru is an annual (sometimes perennial) creeping herb and the entire plant, particularly the fruits are extensively used for the benefits related to sexual health since long. It occurs in almost any soil type but grows best in dry, loose, sandy soils and prospers near the sand dunes or loose blown soil around field margins. It also grows in heavier soils, especially when these are fertile or moist, and on compacted soils such as those found along roadside. Gokhru has been extensively used in the Unani system of medicine as an aphrodisiac and diuretic since long. Studies have shown its potency as a chosen herb for sexual and reproductive health in both the sexes. Recent studies have also shown its effects in certain other ailments related to musculoskeletal system, cardiovascular system, etc. Studies related to Gokhru and its description in the Unani classical literature have been explored and compiled in this paper.

Keywords: Gokhru, aphrodisiac herb, *kharekhask*, *gokshura*, diuretic herb

1. Introduction
Gokhru *is a* tropical plant found all over India. It is an annual (sometimes perennial) creeping herband the entire plant, particularly the fruits are extensively usedfor the benefits related to sexual health since long [1]. The center of origin is in the Mediterranean region [2]. Gokhru is a spiny fruit of herb, size is equal to gram [3, 4]. *Gokhru* is triangular in shape and there are spines in every corners. Leaves are green and fruit is greenish yellow in colour [4]. There are two types of Gokhru, one is Khurd and another is Kalan but Gokhru khurd is commonly used in Unani system of medicine [5].

2. Habitat: Occurs in almost any soil type but grows best in dry, loose, sandy soils and prospers near the sand dunes or loose blown soil around field margins. It also grows in heavier soils, especially when these are fertile or moist, and on compacted soils such as those found along roadside [6].

Botanical Name: *Tribulus terrestris* Linn. [7, 8, 9].
Taxonomic Tree:
Domain: Eukaryota
Kingdom: Plantae
Phylum: Spermatophyta
Subphylum: Angiospermae
Class: Dicotyledonae
Order: Geraniales
Family: Zygophyllaceae
Genus: Tribulus
Species: *Tribulus terrestris* [7, 10]

Vernacular Name:

English: *Caltrops fruits* [11], *Calthrops* [11], Small *Caltrops* [3, 7, 11]. *Land caltrops* [11], *Puncture vine* [12].
Hindi: Gokhru [3, 7, 8, 12, 18], Gokshri [11], Burragokhur [11].

Sanskrit: *Shvadanstra* [11, 12], *Traikantaka* [11], *Gokshuru* [11, 12, 18], *Bahukantaka* [11].

Arabic: *Khask* [8, 11], *Kharakhusk* [11], *Zufratulajooz* [8, 9], *Hamasulameer* [11], *Kohuj* [9].

Persian*: KhareKhask* [8, 9, 11], *Kharsagosha* [9, 11], *khask* [8].

Urdu: *Gokharu* [11].

Marathi: *Sarate* [11], *Gokharu* [11], *Lahanagokharu* [11], *Sarala* [11], *Sharatte* [11], *Lahangokhru* [11].

Bengali: *Gokshura* [11], *Gokhri* [11], *Gokhru* [11], *Gokhura* [11], *Gokshra* [11], *Gokhuri* [3, 7, 8].

Gujarati: *Nahannagokharu* [11], *Mithagokhru* [11], *Betagokhru* [11].

3. Ethno-botanical description: *Tribulus terristeris* is a variable prostate annual, up to 90 cm in length, commonly found throughout India [21] up to an altitude of *c.* 5,400 m and up to 11000 feet in Kashmir [22].It has a slender fibrous root, 4-5 inches long, cylindrical, and of a light brown color; the odor is faintly aromatic and the taste sweetish and astringent. From the root spring four to five delicate stalks, spreading flat on the ground; these are hairy and extend to 2 and half feet in length; the leaves are pinnated, leaflets 5-6 pairs, nearly round. The flowers are axillary on short peduncle, and composed of five broad obtuse yellow petals; these are succeeded by a roundish five-cornered fruit, about the size of a marble armed with prickles; this ripening divides into five cells each armed with 4 strong sharp thorns and containing several seeds. The cocci are wedge- shaped yellowish when ripe, the external convex being rough between the thorns. When all five are in situ, the fruits presents ten thorns pointing towards the peduncle, and ten pointing outwards round the circumference; the latter are developed first. The seeds are oily and enclosed in very hard stony cells. The taste is faintly aromatic and rather agreeable [13, 17, 14].

4. Chemical constituents: *T. terrestris* contains steroids, saponins, flavonoids, alkaloids, unsaturated fatty acids, vitamins, tannins, resins, nitrate potassium, aspartic acid and glutamic acid [20]. Steroidal saponins and diosgenin is isolated from this plant. It is very rich in proteins and calcium. Dried fruits contain semi drying oil, peroxides, diastase, traces of glucosides, resins, protein and large amount of inorganic matters [15] Yan *et al*. (1986) described the isolation and characterization of steroidal saponins including terrestrosin A, B, C, D and E, desgalactotigonin, gitonin, desglucolanatigonin and F-gitonin. In current times, other steroidal saponins including protodioscin and their respective sulfates, terrestrinins A and B, and Spiro stanol type tribulosin, saponin and beta-sitosterol-d-glucoside have been secluded and characterized [16, 17]. Fruits contain traces (0.001%) of alkaloid, a fixed oil, a small quantity of essential oil, resins and nitrates [18].An ethereal or an alcoholic extract of the powdered fruits yield to water a crystalline residue containing a body precipitated from its solution by ammonia and having the properties of an alkaloid, and associated with hydrochloric acid or alkaline chlorides. The fruits also contain a fat and a resin, the latter probably is the source of the aroma of the drug, as it gives off a fragrant odor when burnt. The fruits contain rather large quantity (14.9) of mineral matter [7].
Temperament: Hot and Dry 1st degree [8, 20, 21, 22].

Part used: Fruit, root and entire plant [3, 8].

Taste: Astringent [16].

Dosage: 5-7g [21, 22, 25]; 4-6g [20]; 7.5 g [8].

Actions: Aphrodisiac [3, 12, 17, 18]; Diuretic [3, 17, 18]; Anti-urolithiatic [13, 12];Tonic [3, 7, 18]; Analgesic [13, 12], Antibacterial [13, 12]; Anti-inflammatory [13, 12]; Antispasmodic [13, 12];Cardio-tonic; [13, 12];CNS depressant; [13]; Demulcent [3]; Cooling [3, 7, 18]; Emollient [12];Appetizer [12]; Digestive [12]; Anthelmintic [12]; Expectorant [12]; Anodyne [12]; Styptic [12].

5. Pharmacological Actions

5.1. On Sexual Function

- *Tribulus terrestris* (TT) is a traditional Unani medicine used to enhance sexual activities.TT caused a considerable increase ($P<0.05$) in the hormones in the treated addicted group and oral consumption of TT could markedly antagonize the reduction of sex hormones and gonadotropins [23].
- Tomova *et al* (1981) and Koumanov *et al*. (1982) in their respective studies observed that the administration of Tribestans a commercial product containing 250 mg of TT to humans and animals for a period of 60–90 days was found to improve testosterone levels, libido and promote spermatogenesis (Tomova *et al*., 1981; Koumanov *et al*., 1971) Clinical studies showed TT improved reproductive function, including increased concentration of hormones such as estradiol, with testosterone being very slightly influenced, thereby improving reproductive function, libido and ovulation [1].
- Kalamegam *et al*. (2008) evaluated the hormonal effects of *Tribulus terrestris* (TT) in primates, rabbit and rat to identify its effectiveness in the management of erectile dysfunction (ED). They found that TT may be useful in mild to moderate cases of ED as it increases some of the sex hormones, possibly due to the presence of protodioscin in the extract. Protodioscin is a phytochemical agent derived from *Tribulus terrestris* L plant, which has been clinically proven to improve sexual desire and enhance erection via the conversion of protodioscine to DHEA (De-Hydro-Epi-Androsterone) [24].
- Tablets of the dried entire plant were administered to 35 patients with oligospermia at a dose of 192 mg/day for 3 month. The treatment produced an improvement in total sperm count and motility. The saponin fraction of the dried entire plant was active when administered by gastric intubation to female rats [26].
- Jashni *et al*. (2012) investigated the effect of *T. terrestris* extract on the primary spermatocyte in rat. The researchers found that*T. terrestris*can probably balance the functions of the male reproductive system and can be used in treatment of male infertility, while affecting the testis spermatocyte. The studies show that *T.terrestris* plant increases secretion of luteotropic hormone from pituitary gland due to containing saponins. Luteotropic hormone is also a special stimulant for production of testosterone and hence can improve sexual function in forms of increased sperm production, improved erectile function and increased libido. Furostanol is one of the saponins in *Tribulus terrestris* with stimulant effect on spermatogenesis. This material significantly improves the quality and quantity of sperm [26].
- *Tribulus terrestris* increases body ability to produce muscular mass and physical strength. Furthermore, it causes production of red blood cells and improvement in circulation and oxygen transportation [20].

- Mosaand Adaay (2012) studied effect of the aqueous extract of *T. Terrestris* on the reproductive system of mature albino female mice. The researchers observed that TT showed significant increase in the number of growing follicles, diameter of mature follicles, endometrial lining cells height and endometrial glands diameter was obtained in both dose levels [27].

5.2 Diuretic Effect

Jabbar and co-workers studied the effects of herbal extract of *T. territris* on the urine output and electrolytes in rabbits and noted significant increase in urine volume over a period. Additionally, they also noted that it significantly decreased the sodium level and serum potassium level throughout the study period. Hence, they recommended that the use of this herb may be promoted as diuretic agent who will be helpful in hypertensive and renal disease patients [2, 17]. Diuretic potential of *T. terrestris* has been evaluated in albino rats. The diuretic effect was credited to the presence of potassium salts in high concentration and this action was confirmed of *T. terrestris* with minimal side effect in albino rats [10].

5.3 Analgesic activity

Chloroform extract of the dried entire plant, administered intra peritoneally to mice showed analgesic effect. The dried fruit, administered by gastric intubation to mice in a preparation containing *Bombyxmori*, *Aconitum sinense*, *Alpinia* species, *Mentha arvensis*, and *Sophora flavescens*, was active vs. acetic acid induced writhing [13].

5.4 Antihypertensive property

5.4.1. *T. terrestris* possesses antihypertensive activity [17]. The biological properties of *Tribulus* extracts include diuretic properties, increased release of nitric oxide from endothelium and nerve endings; it relaxes smooth muscles and increases angiotensin converting enzyme (ACE) inhibition. Hence reduces the hypertension [28, 29]. Adaikan *et al*. (2000) [17] have shown that crude extract of *T. terrestris* enhanced electrically- and nitroglycerine- induced relaxation of the rabbit corpus cavernosum consistent with a pro-erectile function. The mechanism responsible for the antihypertensive activity is still not fully understood.

5.4.2 Sharifi *et al*. (2003) [17, 29] reported a significant antihypertensive effect of an aqueous extract of *T. terrestris* in renin-dependent 2-kidney 1-clip (2K-1C) model of hypertension and suggested that this might be related to its inhibitory effect on angiotensin converting enzyme (ACE) activity. This was based on the observation that treatment with the aqueous extract *T. terrestris* significantly reduced ACE activity in all tissues of the rat.

5.4.3 A role for arterial smooth muscle vasodilation in the antihypertensive effect of *Tribulus terrestris* appeared unlikely especially since Arcasoy *et al*. (1998) failed to observe any relaxant effect of *T. terrestris*in the rabbit aorta even though similar concentrations of the extract inhibited peristaltic movement in sheep ureter and rabbit jejunum [17].

5.4.4 Long-term use of *Tribulus terrestris* results in dilatation and improvement of coronary arteries without any side effects [26].

5.4.5 Water extract of fruit showed cardiotonic activity on cat papillary muscle, frog and rabbit hearts. Ethanol (95%) extract of the entire plant caused increase in the rate and amplitude of frog heart [13].

5.5 Anticholestrolemic & anticholinergic effects

Saponin fraction of dried root, administered by gastric intubation to rabbits decreased the development of protein, carbohydrate, lipid dystrophy of the liver vs. cholesterol loaded animals [13].The dried fruit, administered by gastric intubation to mice in a prepration containing *Bombyxmori*, *Aconitum sinese*, *Alpinia* species, *Mentha arvensis*, and *Sophora flavescens* showed anticholinergic effect [13].

5.6 Antioxidant property

T. terrestris also has antioxidant properties.In another study, the researchers found that the extract from *T. terrestris* significantly reduce the formation of hydroperoxide, thus implying that this species is powerful natural antioxidants [1].

5.7 Anti-bacterial effect

Mohammed (2008) elevated the antimicrobial activity of saponin extracted from *T. terrestris* against the microorganisms examined and saponin extract showed inhibiting effect on Gram-positive and Gram-negative bacteria, indicating presence of broad spectrum antibiotic compounds or simply general metabolic toxins in the plant. *Al-Bayati and Hassan* (2008) studied found antimicrobial and antifungal activity of organic and aqueous extracts from fruits, leaves and roots of *T. terrestris* L. The mode of action of antibacterial effects of saponins seems to involve membrano lytic properties, rather than simply altering the surface tension of the extracellular medium, thus being influenced by microbial population density. Flavonoids have been found *in vitro* to be effective antimicrobial substances against a wide array of microorganisms. Their activity is probably due to their ability to complex with extracellular and soluble proteins and to complex with bacterial cell walls. More lipophilic flavonoids may also disrupt microbial membranes. The antifungal activity of *T. terrestris* may be attributed to various chemicals detectable in its extracts such as saponins [30].

5.8 Hypoglycemic and hypolipidemic effects

The extract of both *T alatus* and *T terrestris* significantly decreased the blood glucose levelsin diabetic rats [31, 32].

5.9 On Musculoskeletal system

Mishra *et al*. (2013) suggested that an important mechanism of anti-arthritic activity is the membrane stability modulating effect. The activity is probable due to presence of flavonoids. These flavonoids are having the surface charge neutralizing effects. It was found that the administration of *T. territris* (200 and 300 mg/kg bodyweight) leads to inhibition of leukocyte migration which may have beneficial effect for joint preservation. The activity may be due to presence of steroidal glycoside.85 Ethanol (95%) extract of the dried entire plant, administered intraperitoneally to mice showed skeletal muscle relaxant activity [13]. Ethanol (95%) extract of the dried aerial plant, showed smooth muscle relaxant activity on rabbit duodenum [21]. Ethanol (95%) extract of entire plant, showed antispasmodic effect on guinea pig ileum [13].

5.10 Antitumor activity

Trouillas *et al*., 2005 found that other saponins, structurally similar to diosgenin, present in *T. terrestris* extracts, may block cell cycle, suppress proliferation and induce apoptosis in human sarcoma cell lines (Trouillas *et al*., 2005). Sisto *et*

al. in their study showed experimental evidence that TT has a preventive efficacy against UVB-induced carcinogenesis and the molecular knowledge on the mechanisms through which TT saponins regulate cell death suggests great potential for TT to be developed into a new medicine for cancer patients [33].

6. Therapeutic applications

6.1. Fruit of *Gokhru* cures burning micturition [25, 8, 9] and *Sozak* (gonorrhea) [8]. It breaks the renal and bladder stones and act as a diuretic. Orally, its fruit powder with honey and goat milk acts as lithotriptic. Powder of *Gokhru* mixed with *Misri*6 g taken orally twice daily, helps in diuresis [8]. Powder of *KhareKhask* mixed with honey when applied over wound it prevents infection [8]. It is useful in dribbling of urine [25, 9], *Darde Masana (Bladder Pain)* [9] (dysuria) and lithotriptic [25]. If fresh leaves after crushing is used it breaks the stones of kidney and bladder [9].

6.2 *Gokhru*is an emmenagogue, useful in uterine diseases. Orally, decoction of fruits is useful in regularizing menstruation [25, 8]. Decoction is also useful in puerperium to remove retained products [8].Orally, powder of *Gokhru*14 g and *kunjadsiyah* 7 g with honey and milk is useful in *Sailanur Rehm* [8]. It is useful in infertility [25].

6.3 Plant and dried spiny fruits are used in decoction or infusion in cases of spermatorrhea, phosphaturia, diseases of genito-urinary system such as dysuria, gonorrhea, gleet, chronic cystitis, calculus affections, urinary disorders, incontinence of urine, gout and impotence; also in uterine disorders after parturition and to ensure fecundity [3].

6.4 Decoction of 20 g of *Gokhru* (boiled in half liter of water and when water remains 100 g) administered 4 hourly help in curing diphtheria [8]. When it is used with honey it cures *Qulah* (stomatitis), infections of oral cavity and throat and inflammations and pain of gums [9].
Gokhru's fresh leaves when crushed and placed over eyes it cures the *Ramad* (conjunctivitis) and *ussara o*f *kharekhask* cures the eye diseases [8].

6.5 Decoction of 20 g of *gokhru* is useful in *IkhtanaqurRehm*(hysteria), *Sira*(epilepsy), *Wehm*(delusion), *Zoafe Dimagh*, *Shaqiqa* (migraine), headache, and *Sadr* (giddiness) [8]. It also cures the *Nazla* (common cold) [8].

6.6 Oil of *Gokhru*is useful in *Nakseer* (epistaxis), and dryness of nose [8].
6.7 Its decoction is useful in cough, shortness of breath, and hoarseness of voice. Decoction with ghee is useful to expel *balgham* [8].

6.8 Gargling with decoction of *Gokhru*cures *Warme Halaq* (pharyngitis, laryngitis) and *Khunnaq* (diphtheria) [8].

6.9 It is useful *Galbae Safra*, *Hararate Jigar*, *Zoafe Jigar*, *Zoafe Tihal*. It is also helpful in jaundice and ascites [8].

6.10 *Gokhru* improves the digestion, appetite and cures the stomach ache. Decoction of *Gokhru* with *Roghan Zard* and sugar each 10 g, twice daily with warm water is useful in *Bawaseer Badi* [8].

6.11 Fruits are also used to cure cough, and scabies [15].

6.12 *Roghan kharekhask* is useful in preventing graying of hair, makes hair strong and shiny [8].

6.13 Powder of *gokhru*, 20 gms and *Filfil Siyah*, 6 g twice daily is useful in liver diseases [8].

6.14 It is used in back ache [25]. *Joshanda* of *Gokhru*is useful as *Muhallil Warm* [25, 8].

6.15 Equal parts of *gokhru* and sesamum seeds taken with goat's milk and honey cures impotence arising from vicious practices [3].

6.16 Orally, decoction of leaves and fruits *Gokhru*25g to 75g twice or thrice daily is useful *Warme Masane Muzmin* (chronic cystitis). Its leaves and fruits decoction with *Roghane Sandal*10 drops thrice daily, orally is useful in *Sozak* (gonorrhea) [8].

6.17 It is useful as *Munzij*, *Mullayin*, and in *Hararate-Jigar* [25]. It is also used in premature ejaculation.[25]It improves the spermatogenesis and can be used in *Qolinj* (Colic) [8, 9].

6.18 Leave increases the menstrual flow, cure gonorrhea [15].

6.19 Its combination with bdellium is used in patient suffering from gonorrheal rheumatism with cystitis [3].

6.20 Leaves of *Gokhru*is *Tagziya Bakhsh* (nutritious) [9].

6.21 Decoction of leaves is useful as a gargle for mouth trouble, painful gums, and to reduce inflammation [15].

6.22 It also works as corrective of stomach function [25, 8].

6.23 Its *usaara* can be used as *Surma* [9].

References

1. Dimitrova DZ, Obreshkova D, Nedialkov P. Antioxidant activity of *Tribulus terrestris*– a natural product in infertility therapy. Int J Pharm Pharm Sci. 2012; 4(4):508-511.
2. Jabbar A, Nazir A, Ansari NI, Javed F, Janjua KM. Effects of *Tribulus terrestris* to study on urine output and electrolytes in rabbits. Professional Med J. 2012; 19(6):843-847.
3. Nadkarni KM. Indian Material Medica. New Delhi: Popular Prakashan, 2010, 1229-32.
4. Abdul Hakeem HM. Bustanul Mufradat. New Delhi: Idarae Kitabus Shifa, 2002, 500.
5. Kabeeruddin M. Makhzanul Mufradat. New Delhi: Idarae Kitabus Shifa, 2007, 203-204.
6. Holm LG, Plucknett DL, Pancho JV, Herberger JP. The World's Worst Weeds. Distribution and Biology. Honolulu, Hawaii, USA: University press of Hawaii, 1977, 610.
7. Dymock W, Warden CJH, Hooper D. Pharmacographica Indica. A history of the principal drugs of vegetable origin. Vol III. New Delhi: Shrishti Book Distributors, 2005, 243-245.
8. Muhiuddin GC. Rehnumae Aqaqeer. Vol I. New Delhi: Eijaz Publication, 2004, 333-338.
9. IbnBaitar. Jami al Mufradat al Adviawal Aghzia (Urdu Translation). Vol II. New Delhi: Central Council for

Research in Unani Medicine, 2000, 46-47.
10. Mohd J, Akhtar AJ, Abuzer A, Javed AMA, Ennus T. Pharmacological scientific evidence for the promise of *Tribulus terrestris*. IRJP. 2012; 3(5):403-06.
11. Anonymous. The Unani Pharmacopoeia of India. Part I. Vol II. New Delhi: Govt. of India Ministry of Health & Family Welfare Dept. of AYUSH, 2007, 52-53.
12. Narayan DP, Kumar U. Agro's Dictionary of Medicinal Plants. Jodhpur: Updesh Purohit for Agrobios, 2005, 352-353.
13. Ross IA. Medicinal Plant of World. Vol. 2. New Jersey: Humana Press, 2001, 411-20.
14. Anonymous. The Wealth of India. Vol. IX. New Delhi: National Institute of Science Communication and Resources, 2003, 283-284.
15. Bhattacharjee SK. Handbook of Medicinal plants. Jaipur: Pointer Publishers, 2004, 353.
16. Ukani MD, Nanavati DD, Mehta NK. A Review of the Ayurvedic herb *Tribulus terrestris* L. Anc Sci Life. 1997; 17(2):144-150.
17. Philips OA, Mathew KT, Oriowo MA. Antihypertensive and vasodilator effects of methanolic and aqueous extracts of *Tribulus terrestris* in rats. J Ethnopharmacol. 2006; 104:351-355.
18. Chopra RN, Nayar SI, Chopra IC. Glossary of Indian Medicinal Plants. New Delhi: National Institute of Science Communication and Resources, 2009, 246.
19. Dymock W, Warden CJH, Hooper D. Pharmacographica Indica. A history of the principal drugs of vegetable origin. Vol III. New Delhi: Shrishti Book Distributors, 2005, 243-245.
20. Abdul Hakeem HM. Bustanul Mufradat. New Delhi: Idarae Kitabus Shifa, 2002, 500.
21. Kabeeruddin M. Makhzanul Mufradat. New Delhi: Idarae Kitabus Shifa, 2007, 203-204.
22. Kabeeruddin H. IlmulAdviaNafeesi. New Delhi: Eijaz Publications, 2007, 276.
23. Moghaddam MH, Khalili M, Maleki M, Ahmad Abadi ME. The effect of oral feeding of *Tribulus terrestris* L. on sex hormone and gonadotropin levels in addicted male rats. Int J Fertil Steril. 2013; 7(1):57-62.
24. Adimoelja A. Phytochemicals and the breakthrough of traditional herbs in the management of sexual dysfunctions. Int J Androl. 2000; 23(Suppl 2):82-4. doi: 10.1046/j.1365-2605.2000.00020.x
25. Najmul Ghani, Khazianul Advia. Lucknow: Munshi Naval Kishore Press; YNM: 1156-1158.
26. Jashni K, Shiravani M, Hoshmand. The effect of *Tribulus terrestris* extract on spermatogenesis in the rats. Journal of Jahrom University of Medical Sciences. 2012; 9(4):7-11.
27. Mosa AAR, Adaay MH. Evaluation of the effect of aqueous extract of *Tribulus terrestris* on some reproductive parameters in female mice. J Mater Environ Sci. 2012; 3(6):1153-1162.
28. Evan WC. Trease and Evans Pharmacognosy. 15 ed. India: Saunder, 2005, 43.
29. Sharifi AM, Darabi R, Akbarloo N. Study of antihypertensive mechanism of *Tribulus terrestris* in 2K1C hypertensive rats: role of tissue ACE activity. Life Sci. 2003; 73(23):2963-71.
30. Bayati FAA, Al-mola HF. Antibacterial and antifungal activities of different parts of *Tribulus terrestris* L. growing in Iraq. Zhejiang UnivSci B. 2008; 9(2):154-159.
31. EL-Tantawy WH, Hassanin LA. Hypoglycemic and hypolipidemic effects of alcoholic extract of *Tribulusalatus* in streptozotocin-induced diabetic rats: A comparative study with *T. terrestris*. Indian J Exp Biol. 2007; 45(9):785-90.
32. Amin A, Lotfy M, Shafiullah M, Adeghate E. The protective effect of *Tribulus terrestris* in diabetes. Ann N Y Acad Sci. 2006; 1084:391-401. doi: 10.1196.
33. Sisto M, Lisi S, D 'Amore M, De Lucro R, Carati D, Castellana D *et al*. Saponins from *Tribulus terrestris* L. protect human keratinocytes from UVB-induced damage. J Photo chem Photobiol B. 2012; 117:193-201. doi: 10.1016/j.jphotobiol.2012.10.002.