

A REVIEW ON THE AYURVEDIC HERB TRIBULUS TERRESTRIS L.

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ABSTRACT: *Gokhshura (Tribulus Linn) of Family Zygophyllaceae is an indigenous plant which has been mentioned in Ayurveda with several clinical properties. The plant finds use in one form or the other in various ayurvedic preparations and this has been made it necessary to review the various studies carried out in its chemistry as well as pharmacology.*

INTRODUCTION

Tribulus terrestris (L) (Family:- zygophyllaceae) is popularly know as Gokhshura in Sanskrit. The Sanskrit literature on ayurveda describes many uses of the plant. Dwivedi ⁽¹⁾ in Bhavaprakash nighantu in shloka No. 43, 44. states that:-

“goksura: Sitala:
Svadurvalakrdvastisodhana: madhuro,
dipano vrsya: pustidascasmarihara:
Pramehasvasakasarsa: Kracchra hdroga
vatanut.” (Bhavaprakasa:) ⁽²⁾

It is sheetala, svadu, invigorating; useful in the treatment of urinary affection; madhura; gastric stimulant, aphrodisiac; nutritive; used in the treatment of urinary calculi, polyuria, dyspnoea; cough, piles dysuria, heart disease, pacifies deranged vata.

Our ancient rishis have described various medicinal properties of the herb. An attempt has, therefore, been made to study beneficial effects of the herb on human system and review the chemistry of Gokhshura and establish relationship between medicinal properties and chemistry of the plant.

Habitat

Gokhshura is found in waste land and dry bahitats through the warmer region of India including west Rajasthan and Gujarat.

Botany

Gokhshura is small prostrate, hirsute or silky hairy herb. Fruits are roundish, some what compressed., five cornered and covered with princkles of a lightish yellow colour. Seeds are several, oily and encoised in hard stony cells. They taste astringent and it is agreeable. The root when fresh is slender, fibrous, cylindrical and of a light brown colour. *T. terrestris* has two varieties (1) Mitha (sweet) and kadwa (bitter) Gokhru. Kadwa gokhru is bitter and mucilaginous, while the true gokhru is astringent and alternative.

Uses

One of the ten ingredients of Dashmula kwath consists of Gokhshura. The leaves are useful in affection of urinary calculi. It is stomachic the stem is astringent. Its infusion is useful in gonorrhoea. The roots are aperients, demulcent and tonic.

Chemistry

Gheorghiu et al.⁽³⁾ have reported presence of chlorogenin and gitogenin (1) with diosgenin(2).

Bhutani et al.⁽⁴⁾ have reported kaempferol 3-glucoside, kaempferol 3 – rutinoside and tribuloside (4) from fruits and leaves of *T. terrestris*.

Kintya et al.⁽⁵⁾ have reported five diosgenin glycosides. One contained glucose arabinose, and rhamnose, two contained glucose and rhamnose and remaining two contained only glucose.

Tomova et al.⁽⁶⁾ have reported campesterol, β -sitosterol (5), stigmasterol (6) diosgenin (2) and neotigogenin from roots of *T. terrestris*. The same authors⁽⁷⁾ have further reported a new saponin – terrestroside F- along with saponins C and G from aerial parts; saponin C and G proved to be mixture of two tigogenin and diosgenin glycosides each containing glucose rhamnose and astragalinalin.

Perpelista et al.⁽⁸⁾ have reported trillin(7) gracillin(7) and dioscin (7).

Tomova et al.⁽⁹⁾ further reported hecogenin (8) from *T. terrestris*.

Gill et al.⁽¹⁰⁾ have reported two alkaloids, Harman and harmol from the whole plant.

Two new steroidal glycosides neohecogenin glucoside and tribulosin (9) have been isolated from aerial parts of *T. terrestris*⁽¹¹⁾

Ren et al.⁽¹²⁾ have reported a new derivative of cinnamic amide from tribulus terrestris, A new cinnamic amide derivative named terrestriamide and a known compound 7,

Methylhydroindanone -1 have been reported by the same authors.

Pharmacology

The diuretic properties no doubt are due to the large quantities of the nitrates present as well as the essential oil which occurs in the seeds.⁽¹³⁾

Bose et al.⁽¹⁴⁾ in their experiments reported that the alkaloids fraction did not affect the blood pressure of dogs but depressed the frog heart in situ. It produced inhibition of acetylcholine induced contractions of the isolated intestine of rat and had a moderate diuretic effect. The diuretic action may be ascribed to the alkaloid fraction besides the potassium content.

The diuretic activity has been a subject of detailed study in both human beings and animals. In dogs, the fruit showed activity comparable to that of urea. But in the rats, the activity was less, the diuretic effect of the seeds as well as the aqueous extract of the ashes, obtained by burning the seeds, has been studied in albino rats; in isotonic solution. Their action was found to be comparable to that of potassium chloride. Besides the potassium content of the fruits, the diuretic effect has also been ascribed to the alkaloidal fraction present in the seeds.⁽¹⁵⁾

Tomova et al.⁽¹⁶⁾ in their experiments obtained a preparation “Tribestan” has been obtained from *Tribulus terrestris* having a stimulating effect on sexual functions. The presence of the saponins protodioscine and protograciline has been confirmed via structural determinations. The preparation has been standardized on the basis of the predominating component protodioscine. Clinical trials in males manifested a stimulating effect on spermatogenesis. The

effect on females is manifested with improved oviduct activity and administration in cases of frigidity and sterility is advised.

Twaij et.al⁽¹⁷⁾ in their experiments with aqueous extract of the plant showed a molluscicidal activity at 50-100 ppm concentration against *Bulinus truncatus*.

Bowen et al⁽¹⁸⁾ in their clinical observations on 406 cases of angina pectoris of coronary heart disease treated with saponin of *T. terrestris* found that it dilated coronary artery and improved coronary circulation and thus proving better effects on improving ECG of myocardial ischemia.

Diuretics

Substances that increase the output of urine are called diuretics. The first factor in diuretics is glomerular filtration which is mainly determined by:-

- (1) The rate of blood flow through the kidney substance.
- (2) Number of functioning renal units at a time.
- (3) Osmotic pressure of plasma proteins.
- (4) Hydrostatic pressure in the glomeruli.
- (5) Permeability of the filtering membrane.

As against these, the factor of tubular reabsorption which vitally affects the amount of glomerular filtrate and which would

finally find its way to the pelvis of the kidney as urine.

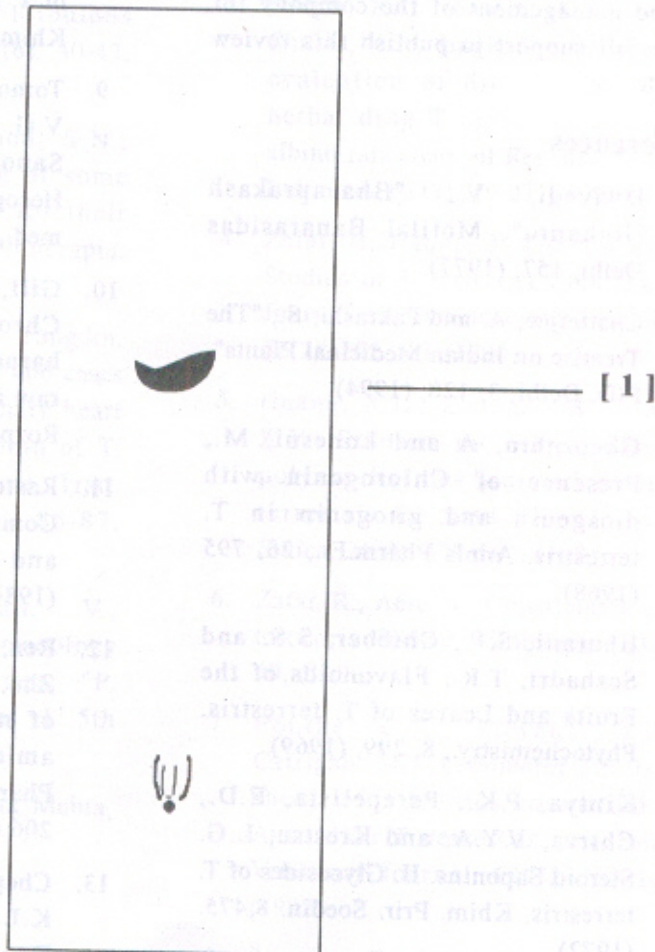
T. terrestris has potassium and fair amount of nitrates, and these two ions are very important in their function from the point of view of diuresis. The potassium ion is very quickly excreted by the kidneys. Being the chief-cation of the intracellular fluid, an excess in the plasma is treated as foreign low-threshold substance and hence is excreted rapidly. The nitrate ion is a low-threshold body and leads to diuresis. When the salt is given by mouth, the salt used is potassium nitrate 0.8-1Gm. Which is the best oral saline diuretic⁽¹⁹⁾

Identification

In the Identification of crude drug, Pharmacognostic techniques are often used, but such techniques do not help us in assessing Ayurvedic preparations. In Ayurvedic pharmacy, when an Ayurvedic herb is obtained from a market, it is very important that it is properly identified from the point of view of its chemistry. It is for the benefit of such units, some results of TLC have been reproduced. (see Fig 1)

The TLC study was carried out by Parekh, Vora and Mehta⁽²⁰⁾ and thin layer chromatogram (Fig 1) is presented in the text for the benefit of the phytochemists.

TLC PATTERN OF T - TERRESTRIS



SOLVENT SYSTEM:-

Water + EtoH = Butanol + Acetone

[13] : [3] : [3] : [1]

Rf Value :- [1] 0.83

* The spots were developed by exposing the plate to iodine vapour.

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References

1. Dwivedi, V., "Bhavaprakash Nigantu", Motilal Banarasidas Delhi, 157, (1977).

2. Chatterjee, A. and Pakrashi, S., "The treatise of Indian Medicinal Plants", PID, Delhi,3, 128, (1994).
3. Gheorghiu, A and Ionescu, M., presence of chlorogenic acid with diosgenin and gitogenin in *T. terrestris*. *Annls Pharm. Fr.*, 26, 795 (1968).
4. Bhutani, S.P., Chibber, S. and Seshadri, T.R., Flavonoids of the fruits and leaves of *T. terrestris*. *Phytochemistry*. 8, 299, (1969)
5. Kintya, P.K., Perepelista, E.D., Chirva, V.Y.A and Krestsu, L.G. Steroid saponins. II Glycosides of *T. terrestris*. *Khim Prir. Soedin.* 8,475, (1972).
6. Tomova, M.P., Panova, d.L and Vulfson N.S. Phytosterol from *T. terrestris*. *Dokl. Bolg. Akad Nauk*, 26,379,(1973).
7. Tomova, M.P., Panova, d.L and Vulfson N.S. Steroid Saponins and saponogenins IV. Saponins from *T. terrestris*. *Planta med.*, 25,231, (1974).
8. Perepelista, E.D. and Kintya, P.K. Chemical study of steroid glycosides of *T. terrestris* IV steroid saponins, *Khim Prir, soedin.*, 11,260 (1975).
9. Tomova, M.P., Bochova, D., Zaiku, C.G and Vulfson, N.S. Steroid Saponins and saponogenin V. Hecogenin from *T. terrestris*. *Planta med.*, 32,223, (1977).
10. Gill, S. and Raszeja W. chromatographic analysis of harman derivatives in some plant raw materials, *Gdansk. Tow Nauk Rozpr. Wydz.* 8,137, (1971).
11. Rastogi, R.P and Mehrotra, B.N" *compend. Ind Med. Plants CDRI and PID Lucknow.* 3, 655-656. (1984).
12. Ren U.J., Chen H.S., Yong, G.J., Zhu, H, Isolation and identification of new derivative of cinnamic amide from *T. terrestris*. *Acta Pharmaceutica. Since.*, 29(3). 204- 206 (1994).
13. Chopra, R.N., Chopra, I.C., Handa, K.L., Kapur, L.D." *Indigenous Drugs of India"* Academic publishers, Calcutta. 2nd Ed., 431, (1958).
14. Bose, B.C, Saifi, A.Q., Vijayavargiya, R. and Bhatnagar, J.N. Some aspects of chemical and pharmacological studies of *T. terrestris*. *Indian. J. med Sci.*, 17, 291, (1963).
15. Chadha, Y.R., "The wealth of India". PID. New Delhi, X, 284, (1976).
16. Tomova, M. *TRIBESTAN"* (a preparation from *Tribulus terrestris*). *Farmatsiya.* 37(6), 40-42, (1987)

17. Twaij, H.A.A., Mahmoud, S.N., Khalid, R.M Screening plants for their molluscicidal activities. *Fitoterapia*, 60(3), 267-268, (1989).
18. Bowen, W., Long'em M., Tong,ku, L. Clinical observation on 406 cases of angina pectoris of coronary heart disease treated with saponin of *T. terrestris*. *Chinese J. of Inte. Trad. And West. Med.* 10 (2)., 85-87, (1990).
19. David. J.C., Iswariah, V., Guruswami, M.N., "Pharmacology and Pharmacology therapeutics. "P. Varadachary & Co. Madras -1. 5th Ed., 370, 372, 380 (1967).
20. Parekh, R.K., Vora, K.S and Mehta, N.K., (Unpublished Work).

Other References

1. Karnick, C. Some observation on lithotomy of kidney and urinary bladder calculi using ayurvedic crude drugs. *J. of Nat Inte. Med. Asso.*, 31(5), 12-17, (1989).
2. Jit, S., Shekhawat., S., Grover, S., Nag. T.N. Screening of some plants of Zygophyllaceae for their antimicrobial activity. *Acta. Botanica Indica*, 14(1), 45-47 (1986)
3. Singh, R.G. Singh R.P., Usha, shukla, K.P., Singh P. Experimental evaluation of diuretic action of herbal drug *T. terrestris* Linn. On albino rats *Jour of Res and Edu. In Ind. Med* 10(1), 19-21. (1991).
4. Zafar, R. Haque, J. Tissue culture studied in *T. terrestris* Linn. *Indian journal of pharmaceutical science.* 52(2), 102-103 (1990).
5. Huang. X.L., Zhang, Y.S, Liang, Z.Y Studies on water soluble polysaccharides isolated from *T. terrestris* L. *Acta Pharmaceutical science*, 26(8), 578-583, (1991).
6. Zafar, R., Aere, V., Constituents of *T. terrestris* followers. *Fitoterapia*, 63(1), 90, (1992).
7. Bourke, C.A., Stevens, G.R., Carrigan, M. Locomotor effects in sheep of alkaloids identified in Australian *T. terrestris*. *Australian veterinary Journal*, 69(7), 163-165, (1992).
8. Sangeeta, D., Sidhu, H., Thind, S.K., Nath, R., Vaidyanathan, S. Therapeutic response of *T. terrestris* aqueous extract on hyperodalurria in male adults rats. *Phytotherapy research* 7(2), 116-119, (1993).
9. Anand, R., Patnaik, G.K., Kulshrehtha, D.K., Dhawan, B.N. Activity of certain fractions of *T. terrestris* fruits against experimentally induced urolithiasis in rats. *Indian journal of experimental biology.* 32(8), 548-552, (1994).
10. Sangeeta, D. Sidhu, H., Thind, S.K., Nath, R., Effect of *T. terrestris* on oxalate metabolism in rats. *Journal of Ethanopharmacology.* 44(2), 61-66, (1994).