



Phytochemical, Pharmacological Profiles of *Tragia involucrata*

P.Ravi^{1*}, V.RamaRao¹ and K.E.Pravallika¹

¹ **University College of Pharmaceutical sciences, Acharya Nagarjuna University,
Nagarjuna Nagar, Guntur - 522 510, A.P, India.**

Abstract : *Tragia involucrata* is a slender, twining her with stinging hairs. The various activities were assessed by anti-inflammatory activity with carrageenan induced rat paw oedema, diuretic activity by Lipschitz model and anthelmintic activity by earthworm model, analgesic activity by radiant heat induced nociception. The Preliminary phytochemical investigation revealed the presence of tannins and flavanoids in petroleum ether extract of *Tragia involucrata*, alkaloids in chloroform extract of *Tragia involucrata* and saponins in aqueous extract of *Tragia involucrata*. All the three extracts exhibited anti-inflammatory, analgesic, diuretic and anthelmintic activities. This review provides a basis for future investigation of *Tragia involucrata* species and especially for those species that have not been explored for phytochemical and pharmacological activities.

Keywords : *Tragia involucrata*, antibacterial activity, solvent extracts, antiepileptic activity, antihistaminic activity.

Introduction:

Tragiain volucrata Linn. (Euphorbiaceous) is a perennial herb. In these days herbal medicines are used in daily life to treat common ailment to life threatening diseases. The root is also used in old venereal complaint and bloodpurifiers¹. Most of the drugs available in the market are mainly isolated from the herb source. For example digitoxin from *Digitalis purpuria* used as cardiotoxic, vincristine and vinblastine from *Catharanthus roseus*, podophyllotoxin from rhizomes of *Phodophyllum* species, paclitaxol from *Taxus brevifolia* used in cancer chemotherapy, caffeine from *Camellia sinensis*, morphine, codeine thebaine from the *Papaver somniferum* for central nervous system activities². The objective of the present review is to compile the phytochemical, pharmacological studies of the *Tragia* species. In this review article, the key words including *Tragia involucrata*, antibacterial activity, solvent extracts, antiepileptic activity and antihistaminic activity were searched for in Web of Science, Pub Med, Scopus, and International Science Citation Center.

Scientific Classification

Kingdom: Plantae
Phylum: Mangoleophyta
Class: Mangoliopsida

P.Ravi et al /International Journal of ChemTech Research, 2018,11(06): 37-42.

DOI= <http://dx.doi.org/10.20902/IJCTR.2018.110605>

Order: Malpighiales
Family: Euphorbiaceae
Genus: *Tragia*
Species: *Involucrata*

Phytochemical Constituents:

Chloroform extract of Whole plant of *T. Cannabina* contains tannins, flavonoids and sterols. Methanol extract of whole plant of *T.cannabina* contains alkaloids and tannins^{3,4}. Ethanol extract of *Tragia involucrata* leaf contains Alkaloids, Glycosides, Flavonoids, sterols⁵. Petroleum ether extract of *T. involucrata* root contains sterols. Chloroform extract of *T.involucrata* root contains alkaloids and sterols. Ethyl acetate extract of *T. involucrata* root contains alkaloids. Methanol extract of *T. involucrata* root contains reducing sugars, tannins, flavanoids, saponins^{6,7}. Water extract of *T.involucrata* root contains reducing sugars, tannins, proteins, flavanoids and saponins⁸. Ethanol extract of *T. spathulata* leaf contains alkaloids and glycosides. Methanol extract of *T.spathulata* leaf contains alkaloids and glycosides. Acetone extract of *T.spathulata* leaf contains alkaloids and glycosides⁹. Ethanol extract of

T. plukenetii leaf contains alkaloids, glycosides, flavanoids, tannins, saponins, sterols¹⁰. Ethanolic extract of whole plant of *T.bentharii* contains alkaloids, reducing sugars, tannins, and saponins¹¹.

Antimicrobial Activity:

The zones of inhibition were formed in the antimicrobial screening test indicated, that the silver nanoparticle synthesized in this process has the efficient antimicrobial activity against pathogenic bacteria and fungi¹². Antimicrobial activity of *T. involucrata* root extracts as well as isolated compounds was determined by “disc diffusion” method. The antimicrobial activities noticed among the various solvent extracts of roots of *T. involucrata* were found to be maximum in case of ethyl acetate extracts in the concentration of 250mg/ml. Maximum zone of inhibition (ZOI) against gram positive strains of bacteria was found to be 22.4 mm against *Staphylococcus aureus* (gm. +ve bacteria) which was comparable with that of the standard drug, Chloramphenicol (21.5mm inhibition) in a concentration of 25 µg/ml, 13.2 mm against *Escherichia coli* (gm. –ve bacteria) which was comparable with that of 16.5 mm inhibition of Chloramphenicol in a concentration of 25 µg/ml and 13.5 mm against *Malassezia furfur* (fungi) which was comparable with that of 14.2 mm inhibition of the standard drug, Ketoconazole in a concentration of 25 µg/ml. The lowest MIC (minimum inhibitory concentration) against almost all selected gram positive and gram negative bacteria and fungi were observed in ethyl acetate extract of *T.Involucrata*¹³⁻¹⁴.

Antirolithiatic Activity:

The urolithiasis inhibitory effect might have been due to the rich content of bioactive phenols, flavonoids and terpenoid contents of the *Tragia involucrata*. The inhibitory activity was more pronounced in the prophylactic group of silver nanoparticles as compared to the group receiving prophylactic treatment with *Tragia involucrata*. The above studies conclude that both *Tragia involucrata* and silver nanoparticles obtained from the aqueous leaf extract of *T.involucrata*. The *T.involucrata* can be employed as an alternative medicine for the prophylactic treatment of urolithiatic condition¹⁵.

Antiepileptic Activity:

An anticonvulsant activity of methanolic extract of *Tragia involucrata* studied in mice. In vivo screening models like maximal electroshock-induced convulsion (MES), picrotoxin (PTX), pentylenetetrazole (PTZ) induced models are used to evaluate the anticonvulsant effects of the *tragia* extracts. In the maximal electroshock induced convulsion, methanolic extract of *Tragia involucrata* at high dose (800 mg/kg body weight), showed high significant inhibition on tonic hind limb extension (6.83 ± 0.30) and decrease in duration of stupor period (108.7 ± 6.53). In pentylenetetrazole and picrotoxine induced model methanolic extract of *Tragia involucrata* (400 mg/kg and 800 mg/kg) showed significant delay on the onset of convulsions, decreased duration of convulsion and reduced mortality significantly. It also showed significant decrease in brain MDA level in lipid peroxidation profile, and increase in the brain glutathione levels in mice against Pentylenetetrazole induced convulsion. The *Tragia involucrata* possesses dose dependent antiepileptic activity^{16,18}.

Nephro Protective and Antioxidant Activity:

In investigation of the nephroprotective and antioxidant activities of ethanol extract of *Tragia involucrata* at two dose levels of 250 and 500 mg/kg B/W on acetaminophen (APAP) induced toxicity in male albino rats. Increased levels of haemoglobin (Hb), total leukocyte count, DLC, and mean corpuscular volume, raised body weight, and reduced levels of neutrophils, mean corpuscular haemoglobin(Hb) content, uric acid, and platelet concentration are significance of acetaminophen. *Tragia involucrata* inhibited the haematological effects of acetaminophen. *Tragia involucrata* significantly increased activities of renal superoxide dismutase, catalase, glutathione, and glutathione peroxidase and decreased malondialdehyde content of APAP-treated rats^{17,29}.

Anti Histaminic Activity:

Tragiae involucrata leaves gives 5-hydroxy-1-methylpiperidine-2-one for antihistaminic activity. It has bronchorelaxant, muscle relaxant and antiallergic activity. A promising muscle relaxant, bronchodilator and anti-allergic effect of 5-hydroxy-1-methylpiperidine-2-one was observed in histamine-induced guinea pig and found to be 55.54±2.78% protection at the dose level of 12.5 mg/kg in bronchoconstriction effect and 49.05±2.45% protection in triple response¹⁹.

Antifertility Activity:

The standard drug ethanylestradiol action was potentiated by *Tragia involucrata* extract. The ethyl acetate and hexane extracts of the aerial parts of *Tragia involucrata* have been evaluated for the antifertility activity in proven fertile female rats at dose of 200mg/kg body weight. Phytosterols, triterpens, flavanoids in the extracts showed in preliminary phytochemical analysis which is responsible for anti-fertility effect. The extracts have anti-implantation as well as the abortifacient activity and are safe at the effective antifertility doses²¹.

Anti-Arthritic and Hemolytic Activity:

Chloroform, petroleum ether, ethyl acetate and aqueous extract of *Tragia involucrata* used for in-vitro anti-arthritic and haemolytic activity. The chloroform extract shows maximum inhibition of anti-arthritic activity of 93% at the concentration of 200µg/ml. The haemolytic activity of the extracts on human erythrocytes was performed by standard method. The extracts were found to be non-haemolytic against the RBC membrane. Protein denaturation method was used for study of the in vitro anti-arthritic effect of *T.involucrata* leaf extracts. The chloroform and petroleum ether extract contain potent molecules with antiarthritic property^{22,30}.

Diuretic Activity:

The diuretic activity of hot water extract of *T.involucrata* made out of the total plant. *Tragia involucrata* exhibits significant diuretic activity and it acts similar to that of a loop diuretic. Among the tested extracts, aqueous extract of *T. involucrata* showed the maximum diuretic activity with 2.61 diuretic actions and 0.94 diuretic activities. In the present study, aqueous extract prepared from *T. involucrata* whole plant at a dose of 1650 mg kg⁻¹ showed maximum diuretic activity with 2.17 of diuretic action and 0.76 of diuretic activity. The diuresis action of *Tragia involucrata* is similar to that of loop diuretics the extract may be useful as a natural therapeutic agent in the treatment of pulmonary oedema, chronic heart failure and hypertension conditions. One major limitation of *T.involucrata* extracts is that the increased risk of hypocalcaemia similar to other loop diuretics. Na⁺ and K⁺ ions concentration were estimated by Electrolyte Analyzer (ListonECS- 2000) and chloride concentration was estimated by Urinometer²³.

Anthelmintic Activity:

The anthelmintic assay was done on adult Indian earthworm *Pheretima posthuma* and the aquarium worm, *Tubifex tubifex*, because they belong to same group of Annelida. Anthelmintic activity of petroleum ether extract of *Tragia involucrata*, chloroform extract of *Tragia involucrata* and aqueous extract of *Tragia involucrata* were carried out using earth worm model. The methanolic extract of *Tragia involucrata* Linn was used to evaluate anthelmintic activity. All the three extracts i.e., PETI, CHTI and AQTI extracts of roots *T.involucrata* showed dose dependent anthelmintic activity and also death. The anthelmintic activity exhibited

by different extracts of *Tragia involucrata* were in the order, AQTI>CHTI>PETI with the three prefixed concentrations of 0.1% w/v, 0.2% w/v and 0.3% w/v respectively. Alkaloids, tannins and saponins were reported to possess anthelmintic activity. The difference in anthelmintic activity with the above extracts might be due to number of active phytoconstituents present with them²⁴.

Anti-Inflammatory Activity:

Alcohol extract of plant *Tragia involucrata* shows anti-inflammatory activity. Anti-inflammatory activity of aqueous extract of *Tragia involucrata* was tested on carrageenan-induced hind paws oedema and cotton pellet granuloma models in albino rats. The aqueous leaf extract (400mg/kg) showed maximum inhibition (84.23%) of oedema at the end of 3 hours following carrageenan-induced rat paw oedema. In subacute inflammation, the extract showed 76.25 reductions in granuloma weight. The results prove that the aqueous leaf extract showed highest anti-inflammatory activity in acute and subacute inflammation^{20,25-27}.

Analgesic Activity:

Analgesic activity of ethanolic extracts of *Tragia involucrata* in acetic acid induced writhing method has been tabulated. Number of abdominal writhing in *Tragia plukenetii* was high, but the percentage of inhibition was very much reduced than *Tragia involucrata*. *Tragia involucrata* has more analgesic activity than control (Piroxicam 10 mg). It may be due to the presence of crude chemical constituents. The results indicated that extracts considered for analysis have little more analgesic activity than those from control group. *Tragia involucrata* has a higher effect (68.20%). This indicates that plant extracts are little more potent active as analgesic agent. Significant reduction of licking response in Eddy's hot plate method has also been tabulated²⁵⁻²⁸.

Conclusion:

India is rich in various herbal, medicinal plants which can be used for treating various diseases. *Tragia involucrata* Linn is one of them which serve as an important source of many therapeutically efficient compounds possessing many traditional and pharmacological activities. In the present study, the pharmacological actions can be attributed to the presence of alkaloids, steroids, flavanoids, tannins and saponins in aqueous, ethanolic, methanolic, chloroform, petroleum ether extracts of *Tragia involucrata*. The methanolic leaf extract of *Tragia involucrata* Linn has demonstrated potential antiepileptic properties and safe in the experimental animals at the doses used. The isolated 5-hydroxy-1-methylpiperidine-2-one from *T. involucrata* Linn has potent antihistamine agent on histamine-induced guinea pig. Both *Tragia involucrata* and AgNPs obtained from the aqueous leaf extract of *T. involucrata* can be employed as an alternative medicine for the prophylactic treatment of urolithiatic condition. The ethanol extracts of *Tragia involucrata* therapeutically useful nephroprotective agent. Therefore, further studies to explain their mechanisms of action should be conducted to aid the discovery of new therapeutic agents for the treatment of various diseases.

References :

1. Dash G.K, Subburaju T, Khuntia T.K, Khuntia J, Moharana S, and Suresh P. Some Pharmacognostical Characteristics of *Tragia involucrata* Linn Roots. Ancient Science of Life., 2000, 20(1&2):1-5.
2. Srinivasa Reddy Bonam, Rama Rao Nadendla, Vijeepallam Kamini, Pandey Vijayapandi. Phytochemical, pharmacological and biological profiles of *Tragia* species (family: Euphorbiaceae). Afr J Tradit Complement Altern Med., 2017, 14(3): 105–112.
3. Panda D, Santhosh Kumar D, Gouri Kumar D. Phytochemical Examination and Antimicrobial Activity of Various Solvent Extracts and the Selected Isolated Compounds from Roots of *Tragia involucrata* Linn. International Journal of Pharmaceutical Sciences and Drug Research., 2012, 4:44–48.
4. Raju VH, Ganapaty S, Prasanna Shankararao S, Vijaya GJ, Kishori PS, Asif AK. Phytochemical and pharmacological evaluation of *Tragia cannabina* for anti-inflammatory activity. International Current Pharmaceutical Journal., 2012, 1:213–216.
5. Patel RK, Patel SB, Shah JG. Evaluation of acute and sub-acute toxicity of alcoholic extract of the roots of *Tragia cannabina* in rats. International Journal of Pharmaceutical Sciences and Research., 2012, 3:479–482.

6. Kalaivanan M, Jesudass L. Pharmacological studies on ethanol extract of *Tragia plukenetii*. IOSR Journal of Pharmacy., 2012, 2:1–7.
7. SathishSS, Vijayakanth P, Palani R, Thamizharasi T, Vimala A. Antimicrobial and phytochemical screening of *Tragia involucrata Linn* using UV-Vis and FTIR. International Journal of Research in Engineering and Bioscience., 2013, 1:82–90.
8. Dash GK, Subburaju T, Khuntia TK, Khuntia J, Moharana S, Suresh P. Some pharmacognostical characteristics of *Tragiainvolucrata Linn* Roots. Ancient Science of Life., 2000,20:1–5. [PMC free article][Pub Med].
9. Ogundare AO, Olorunfemi OB. Antimicrobial Efficacy of Leaves *Diocleareflexa*, *Mucuna pruriens*, *Ficus asperifolia* and *Tragia spathulata*. Research Journal of Microbiology., 2007,2:392–396.
10. Daniel M. Methods in plant chemistry and Economic Botany. Kalyani Publishers; 1991. pp. 63–64.
11. Oladosu IA, Balogun SO, Ademowo GO. Phytochemical screening, antimalarial and histopathological studies of *Allophylus africanus* and *Tragia benthamii*. Chin J Nat Med., 2013,11(4):0371–0376. [Pub Med].
12. Gobala Krishnan R, Kulandaivelu M, Bhuvaneswari R, Kandavel D, Kannan L. Screening of wild plant species of anti-bacterial activity and phytochemical analysis of *Tragiainvolucrata Linn*. J. of pharmaceutical analysis., 2013,3(6):460–465.
13. Perumalsamy, Ramar, Sethi, Goutam, chow TK, Vincent, Stiles G, Bradley. Plant-based Hydrocarbon Esters from *Tragiainvolucrata* Possess Antimicrobial and Anti-inflammatory Activities. Infectious disorders-drug targets (formerly current drug targets-infectious disorders), 2013,13(2);141-153(13).
14. Saraswathy N and Thirumurugan V. Green synthesis of silver nanoparticles using *Tragia involucrata* stem extract and analysis of their antimicrobial property. I J of Chemical and pharmaceutical analysis., 2017;4(2).
15. Vinodhini Velu & Moonjit Das & Arunai Nambi Raj N & Kamal Dua & Himaja Malipeddi. Evaluation of in vitro and in vivo anti-urolithiatic activity of silver nanoparticles containing aqueous leaf extract of *Tragia involucrate*. J of Drug Deliv and Transl Res., (2017) ,7:439–449.
16. Varma GG, Mathai BK, Das K, Gowda G, Rammohan S, Einstein J W. Evaluation of antiepileptic activity of methanolic leaves extract of *Tragia involucrate Linn* in mice. I. letters of natural sciences., 2014; 12(2).
17. Palani S, Nirmal Kumar S, Gokulan R, Rajalingam D, Senthil Kumar B. Evaluation of Nephroprotective and antioxidant potential of *Tragia involucrate*. Drug Invention Today., 2009, 1(1):55-60.
18. Dhara AK, Pal S, Nag Chaudhuri AK. Psychopharmacological studies on *Tragia involucrata* root extract. Phytother-Res., 2002, 16(4):326-330.
19. Venkata Rao N, Benoy. K, Hemamalini. K, Shanta Kumar SM, Satyanarayana S. Pharmacological evaluation of root extract of *Tragia involucrata*, Pharmacology online., 2007,2:236-244.
20. Dhara AK, Suba V, Sen T, Pal S, and Chaudhary AK. Preliminary studies on anti-inflammatory and analgesic activity of the methanolic fraction of root extract of *Tragia involucrata Linn*. J. Of Ethanopharmacology., 2000, 72: 265-268.
21. Chandra shekhar joshi G, Gopal M. Antifertility activity of hexane and ethyl acetate extracts of aerial parts of *Tragia involucrata Linn*. J. of Pharmacology and Toxicology., 2011,1816-496X.
22. Samy RP, Gopalakrishnakone P, Sarumathi M, and Ignacimuthu S. Wound healing potential of *Tragia involucrata* extract in rats. Fitoterapia., 2006,77: 300-302.
23. Pallie MS, Perera PK, Goonasekara CL, Kumarasinghe MN and L D A M Arawawala. Evaluation of Diuretic Effect of the Hot Water Extract of Standardized *Tragia involucrata Linn* in Rats. International Journal of Pharmacology., 2017, 13: 83-90.
24. Bhagyashree S, Patil I, Raut D, Bhutkar MA, Mohite SK. Evaluation of anthelmintic activity of leaves of *Tragiainvolucrata Linn*. Journal of Pharmacognocny and Phytochemistry., 2015,4(1): 155-159.
25. Srinivasan K. Evaluation of anti-inflammatory activity of *Pongamia pinnata* leaves in rats. Journal of Ethnopharmacology, 2001, 78: 152-157.
26. Raju Venkatagowda Hosahally, Ganapaty Seru, Prasanna Shankarrao Sutar, Vijaya Gopalachar Joshi, Kishori Prasanna Sutar, Asif Abdulrahiman Karigar. Phytochemical and pharmacological evaluation of *Tragia cannabina* for anti-inflammatory activity. International Current Pharmaceutical Journal, 2012, 1(8): 213-216.
27. Ramarperumalsamy, Ponnampalam Gopalakrishna kone, Peter Houghton, Maunghwin, Savarimuthuignacimuthu. Effect of aqueous extract of *Tragia involucrata Linn* on acute and sub-acute inflammation. Phytotherapy research, 2006,20(4),310-312.

28. Alimuzzaman M, Muniruddin Ahmed. Analgesic Activity of *Tragia involucrata*. Dhaka university journal of pharmaceutical sciences, 2005, 4(1).
29. Abdulrahman S, Anazi AL, Jamir Anwar Md and Afroz Ahmad Md. Hepatoprotective and antioxidant activity of *Tragia involucrata* root extracts against CCl₄ induced hepatotoxicity in rats. Der Pharmacia Lettre., 2015, 7 (5):146-152.
30. Vinodhini Velu, Himaja Malipeddi., In vitro Anti-arthritis and Hemolytic Activity of Leaf Extracts of *Tragia involucrata*, International Journal of PharmaTech Research., 2015, 8(7): 46-50.
