



Sphagneticola Trilobata (L.) Pruski: A Pharmacological Review

A.K. Anjana*, P.L. Rajagopal, P.K. Lithashabin, C.V. Yamuna

College of Pharmaceutical Sciences, Government Medical College Kannur, Kerala-670503

ABSTRACT

Sphagneticola trilobata (L.) Pruski, also known as *Wedelia trilobata* (L.), is a tropical perennial flowering plant which is distributed across various parts of the world. This plant has been used as a traditional folk medicine in India, China and other parts of the world. The plant possesses a large number of phytochemicals that contribute to its different pharmacological activities. The various pharmacological activities reported in *S. trilobata* include antioxidant activity, analgesic activity, anti-tumor activity, anti-bacterial activity, anti-fungal activity, anti-inflammatory activity, central nervous system depressant activity, anti-diabetic activity and in the treatment of menstrual pain (dysmenorrhea). This plant also possesses larvicidal activity, anti-hypertensive activity, apoptotic activity, anti-proliferative activity, cytotoxic effects and anti-pyretic activity. Further studies in this plant and its phytoconstituents will reveal more pharmacological activities. It will provide a way for developing lead molecules which may further be used for the development of novel medicinal agents.

Keywords: *Sphagneticola trilobata*, pharmacological activity, phytoconstituents.

*Corresponding Author Email: just4anjanaak@gmail.com

Received 03 January 2020, Accepted 12 January 2020

Please cite this article as: Anjana AK *et al.*, *Sphagneticola Trilobata* (L.) Pruski: A Pharmacological Review. *American Journal of Pharmacy & Health Research* 2020.

INTRODUCTION

Sphagneticola trilobata is a creeping member of the family Asteraceae (formerly known as Compositae). The plant is commonly known as creeping oxeye or yellow dots or Singapore daisy(1). This weed is a thick mat forming creeper that competes with other crops, mainly plantations, for their light, nutrients and water, thus reducing the total plant yield. It prevents the growth of other plants by overcrowding the area(2).

Stems are greenish to red in color, usually rounded and hairy. Leaves are trilobated with serrate margins, greenish in color and are glossy in nature. Flowers are like daisy with ray and disc florets and are yellow in color (1).

PHARMACOLOGICAL ACTIVITIES

Antipyretic Activity

Babu MM et al., collected the plant *Wedelia trilobata* from Gudlavalleru and was identified and authenticated. The whole plant material was dried, grounded and macerated with distilled water for three days and the crude extract is concentrated. Wistar albino rats were selected for performing the experiments and were kept accordingly with the CPCSEA guidelines. Acute toxicity studies were conducted according to OECD guideline no: 423.

To conduct the anti-pyretic study, the animals are divided into five groups containing 6 animals in each group. Pyrexia was induced in animals by injecting brewer's yeast solution (20%). One group served as control, to one group yeast solution was injected, the 3rd group was administered with yeast solution and standard drug paracetamol, and the 4th and 5th group was given yeast solution along with ethanolic extract of *W. trilobata* 100 and 200 mg/kg b.wt respectively. Rectal temperature of rats were checked simultaneously before and after administration at 1st, 2nd and 3rd hour.

It shows that after the study, the ethanolic extract of *W. trilobata* showed significant results by reducing the increased body temperature of rats with respect to the control group. Thus the ethanolic extract of *W. trilobata* possess anti-pyretic activity.(3)

Anti-diabetic Activity

Kade et al. experimented on adult male Wistar rats. Diabetes was induced by injecting streptozotocin diluted in 0.1 M phosphate buffer. Animals were treated with aqueous infusion of *Sphagneticola trilobata* (50mg/kg) for 30 days. After experimental period animals were euthanized under ether anaesthesia. Tissue samples of liver, kidney, spleen and testes were removed, homogenized, centrifuged and used for biochemical analysis. Results revealed that the

body weight of animals treated with *S. trilobata* infusion did not decline when compared to those which are treated with streptozotocin. Also *S. trilobata* the glucose levels of diabetic rats declined markedly.(4)

Jagessar RC conducted an experiment on plants to find out the hypertensive activity and hypoglycemic effect. Anti-diabetic experiments were conducted on guinea-pig models. The experiments concluded that *S. trilobata* possess hypoglycemic activity.(5)

Swarnalatha K et al. conducted an experiment on *S. trilobata* to find out its anti-diabetic potential. The powdered plant material was Soxhlet extracted using various solvents like n-hexane, ethyl acetate, methanol and water according to the polarity. *In-vitro* alpha-amylase inhibition method was used to determine the anti-diabetic activity using acarbose as the standard. This experiment also revealed that *S. trilobata* can be used as a hypoglycemic agent.(6)

Chethan et al. determined the anti-diabetic property of 10 different plants in the Asteraceae family, out of which one was *W. trilobata*. In the experiments, *W. trilobata* extract showed significant α -amylase and α -glucosidase enzyme inhibition activity. Also glucose diffusion decreased significantly in the presence of this plant extract, making *W. trilobata* a potent anti-diabetic agent.(7)

Anti-inflammatory Activity

Giovana et al. conducted a study on *S. trilobata* ethanol spray dried semisolid extracts to find out the anti-inflammatory property of the plant. The study was conducted on male Swiss mice. Ear edema (inflammation in ear) was induced in the right ear of mice by applying croton oil, arachidonic acid and decanoylphorbol-13-acetate (TPA) respectively after 30 minutes of administration of *S. trilobata* semisolid extract, semisolid placebos like Ceteth 20[®] and Steareth 21[®]. The results showed that mice treated with semisolid extract of *S. trilobata* decreased the ear edema significantly than the two semisolid placebos, concluding that the anti-inflammatory effect produced by *S. trilobata* is due to the presence of Kaurenoic acid and novel anti-inflammatory agents can be developed from the plant.(8)

Govindappa et al. studied to assess the *in-vitro* anti-inflammatory potential of ethanol extract of *S. trilobata* leaf, stem and flower. *In-vitro* anti-inflammatory assay was done using inhibition of albumin denaturation, protein inhibitory action and membrane destabilization test by using aspirin as the standard drug. The leaf, stem and flower ethanol extract showed good anti-inflammatory effects which may be due to the presence of phytochemicals. Maximum effect was showed by ethanolic leaf extract.(9)(1)

Anti-oxidant Activity

Swarnalatha et al. performed an analysis of anti-oxidant potential of *S. trilobata* extract by DPPH assay and ABTS assay. Extract was prepared by using solvents like n-hexane, ethyl acetate, methanol and water in their increasing order of polarity. The standard for DPPH assay was ascorbic acid. The methanolic extract showed high DPPH activity with a value of IC₅₀ at 20 µg/ml which is same as that of the standard ascorbic acid, showing the high anti-oxidant potential of *S. trilobata*.(6)

Govindappa et al. studied the antioxidant potential of the ethanolic extract of the leaf, stem and flowers of *S. trilobata* by using DPPH assay and FRAP assay. The study revealed that the ethanolic extract of leaves (86.17%) showed higher activity than that of stem(82.64%) and flower(55.41%) at 0.1mg/mL concentration. The extract is a good proton donor and thus can be good a free radical scavenger and act as a primary antioxidant.(9)

Anti-hypertensive Activity

Chethan et al. performed a study on plants of Asteraceae family which included *W. trilobata* to find out their anti-diabetic and anti-hypertensive potential. Anti-hypertensive action was done by *in-vitro* ACE (Angiotensin-I Converting Enzyme) inhibition assay using the methanolic extract of the plant. 10 µL (1g/10mL) of rabbit lung extract is added to 10 µL (100mg/mL) of plant extract which acted as the negative control while 10µL of captopril solution is used as the positive control. *W. trilobata* showed about 50% ACE inhibition at a concentration of 30µg/mL and 96% ACE inhibition at a concentration of 60µg/mL showing its anti-hypertensive potential.(8)(7)

Anti-Proliferative Activity

Uday Venkatesh et al. investigated the cytotoxic effect and anti-proliferative activity of the methanolic extract of *W. trilobata* using *in-vitro* methods like thymidine uptake assay, MTT assay and wound-healing assay. MTT assay was performed to find out the cytotoxic effect by using MEG-01 (Megakaryoblastic cells) and HEK-293 cells (Human embryonic kidney cells). It showed that with the increase in concentration of the methanolic extract of *W. trilobata*, the proliferation of MEG-01 cells decreased (IC₅₀ value is 80µg/mL). The anti-proliferative effect of methanolic extract of *W. trilobata* is further confirmed in thymidine uptake assay and wound-healing assays, making *W. trilobata* a potent anti-proliferative agent.(10)

Larvicidal Activity

Sowmyashree et al. evaluated the larvicidal activity of different polar and non-polar solvent extracts and essential oil of *S. trilobata* using female *Anopheles stephensi* mosquito. Eggs and

larvae of *An. Stephensi* were collected and treated with different concentrations of the extracts and essential oil using temephos as positive control and acetone as negative control. The larval mortality after 24 and 48 hour of treatment was recorded. They concluded that the essential oil and leaf extract possess larvicidal activity which may be due to the presence of phytochemicals like alkaloids, flavonoids, terpenoids and steroids. (11)

Anti-microbial Activity

Kumudini et al. evaluated the anti-microbial effect of the methanolic and aqueous extracts of the leaf, stem, root and flower of *Sphagneticola trilobata* (L.) Pruski against some human pathogenic bacteria and fungi. Anti-bacterial assay was performed by disc diffusion method against bacteria like *Staphylococcus aureus*, *Salmonella typhi*, *Pseudomonas aeruginosa* and *Mycobacterium tuberculosis*. Nutrient agar medium was used for *Staphylococcus aureus*, *Salmonella typhi* and *Pseudomonas aeruginosa* while Lowenstein Jensen medium was used for *Mycobacterium tuberculosis*. Paper disc is impregnated with the plant extract and placed over the medium with bacteria and incubated and the diameter of zone of inhibition were calculated for each. The results showed that the methanolic leaf extract exhibited a significant antibacterial activity against three bacteria namely, *S. aureus*, *S. typhi* and *P. aeruginosa* with a zone of inhibition of, 16.92 ± 0.58 mm, 12.93 ± 0.28 mm and 8.99 ± 0.46 mm respectively. The aqueous extracts were not at all effective against any of the bacteria.(12)

Anti-fungal activity was evaluated against fungal organisms like *Microsporum canis*, *Epidermophyton floccosum*, *Trichophyton rubrum* and *Aspergillus candidus*. The results showed that all extracts were not effective against all the organisms. The zone of inhibition produced by the methanolic extract of leaf and root and also the aqueous extract of leaf were found to be 17.73 ± 0.46 mm, 16.19 ± 0.33 mm and 15.66 ± 0.63 mm respectively against *Epidermophyton floccosum*. Different *S.trilobata* extracts showed significant activity against *M. canis*, *E. floccosum* and *T. rubrum*.(12)

Ana Grace et al. performed an experiment to determine the antimicrobial activity of hydroalcoholic leaf extract of *S. trilobata*. The microbial organisms used for the study include *Staphylococcus aureus*, *S. epidermidis*, *Staphylococcus spp.*, *Pseudomonas aeruginosa*, *Escherichia coli*, *Serratia marcescens*, *Enterococcus faecalis*, *Klebsiella pneumoniae*, *Salmonella typhimurium* isolated from human skin and *Staphylococcus spp.* isolated from dog skin. Anti-microbial assay was conducted using broth microdilution method. The results concluded that the hydroalcoholic extract of *S. trilobata* showed activity against *E.coli*, *S.*

marcescens, *E. faecalis* and *S. spp* isolated from human skin and *S. spp* isolated from dog skin which may be due to the presence of phtoconstituents like terpenoids and flavanoids.(10)

Wound-healing Activity

N. Balekar et al. experimented on the leaves of *Wedelia trilobata* to find out its wound-healing potential based on the knowledge that these laves were used in the treatment of wounds. The fractions obtained after column chromatography of ethanolic leaf extract include hexane fraction, ethyl acetate (WEA) fraction and chloroform: methanol (WCM) fraction. These fractions were subjected to *in-vitro* wound healing assays like fibroblast proliferation, *in-vitro* scratch assays, oxidative stress using hydrogen peroxide, and increasing collagen content. WEA showed fibroblast stimulating effect and WCM showed antioxidant potential which altogether contribute to the wound-healing potential of the plant *W. trilobata*. The compound responsible for the action exerted by WEA fraction is diterpene.(1,14)

Central nervous system depressant Activity

Tambe et.al studied the CNS depressant activity of *W. trilobata* leaves using its petroleum ether extract (PEE), chloroform extract (CE), ethyl acetate extract (EAE) and methanol extract (ME). The experiments were conducted on Swiss webstar strain mice. Locomotor activity, pentobarbitone-induced sleeping time were checked. In pentobarbitone-induced sleeping time determination, the animals were treated with vehicle, PEE, CE, EAE and ME before 30 minutes of administration of pentobarbitone and the sleeping time was recorded. The duration of sleep induced by the extracts PEE (107min), CE (89min), EAE (84min) and ME (70min) was higher than that of pentobarbitone (42min).

In the locomotor activity testing using a photoactometer, the basal reaction time was recorded before and after the treatment. The animals were treated with vehicle, diazepam, PEE, CE, EAE and ME. The results revealed that the locomotor activity of animals treated with the extracts were reduced drastically than those treated with diazepam. Thus it can be concluded that *W. trilobata* is a potent CNS depressant.(1,15)

CONCLUSION

From the above data, it can be concluded that *Sphagneticola trilobata* is a potent traditional medicine capable for the treatment of various conditions. Apart from the discussed properties, this plant also possess analgesic activity, anti-leishmaniasis activity, cytotoxic and anti-tumor activity and trypanocidal activity.(1) This palnt is also used in the treatment of cold, flu and fever, in the treatment of reproductive problems and dysmenorrhea.(16) The leaves of this plant

are also used in the treatment of kidney dysfunction.(17) Thus it can be concluded that *S. trilobata* possesses a large number of phytochemicals that contributes to its pharmacological actions. Numerous medicinally important properties can further be identified with proper investigation and studies on this plant and a number of potent lead molecules can be obtained with proper identification and isolation of those compounds. Thus a large number of potent medicinal agents can be developed from this ethnomedically important traditional plant in the future.

REFERENCES

1. Balekar N, Nakpheng T and Srichana T. *Wedelia trilobata* L.: A phytochemical and pharmacological review. Chiang Mai J Sci. 2014; 41(3) : 590-605.
2. Essien E, Naresh DRK. *Sphagneticola trilobata* (L.) Pruski: An aromatic invasive agricultural weed abundant in alpha- pinene. New Delhi: AkiNik Publications. 2018; 10: 1-9.
3. Babu MM, Rao AL, Harshitha V, Madhavi V, Lavanya VNS, Vineetha V, et al. Evaluation of antipyretic activity of ethanolic extract of *Wedelia trilobata*. 2018; 2(2): 212-216.
4. Kade I, Barbosa N, Ibukun E, Igbakin A, Nogueira C, Rocha J. Aqueous extracts of *Sphagneticola trilobata* attenuates Streptozotocin-induced hyperglycaemia in rat models by modulating oxidative stress parameters. *Biology and Medicine*. 2010; 2 (3): 1-13.
5. Jagessar RC. Natural antimicrobials and antidiabetic plant extracts, singly and in combination, potential source of novel antimicrobials and hypoglycemic agents. *Nov Appro Drug Des Dev*. 2019; 5(1) :1-3.
6. Kurapati S, Pallapatti RK, Kanikaram S, Bollikolla HB. A quantitative estimation of phytochemicals, anti-diabetic and anti-oxidant activities of crude extracts of *Sphagneticola trilobata* (L.) and *Adathoda vasica* Linn. *J. Nat. Prod. Resour*. 2018; 4(1):155–159.
7. Chethan J, Kumar PPM, Prakash HS. Antidiabetic and antihypertensive potential of selected Asteraceae plant species. *American Journal of Advanced Drug Delivery*. 2014; 2(3): 355-363.
8. Fucina G, Rocha LW, da Silva GF, Hoepers SM, Ferreira FP, Guaratini T, et al. Topical anti-inflammatory phytomedicine based on *Sphagneticola trilobata* dried extracts. *Pharm Biol*. 2016; 54(11): 2465–2474.

9. Govindappa M, Sravya SN, Poojashri MN, Sadananda TS, Chandrappa CP. Antimicrobial, antioxidant and in vitro anti-inflammatory activity of ethanol extract and active phytochemical screening of *Wedelia trilobata* (L.) Hitchc. Journal of Pharmacognosy and Phytotherapy. 2011; 3(3): 43-51.
10. Venkatesh U, Prasad Kollur S. Methanolic extract of *Wedelia trilobata* in antiproliferation and apoptotic activity. Nat Prod Chem Res. 2016; 4(2): 1-5.
11. Sowmyashree K, Chalannavar RK, Malabadi RB. Anti-mosquito properties of *Sphagneticola trilobata* (L.) Pruski against malaria transmitting mosquito *Anopheles stephansi*. ISCA. 2015:1.
12. Toppo KI, Gupta S, Karkun D, Agrwal S, Kumar A. Antimicrobial activity of *Sphagneticola trilobata* (L.) Pruski, against some human pathogenic bacteria and fungi. The Bioscan. 2013; 8(2): 695-700.
13. Leite AGB, Farias ETN, Oliveira AP de, Abreu REF de, Costa MM da, Almeida JRG da S, et al. Phytochemical screening and antimicrobial activity testing of crude hydroalcoholic extract from leaves of *Sphagneticola trilobata* (Asteraceae). Ciência Rural. 2019; 49(4): 1-6.
14. Balekar N, Katkam NG, Nakpheng T, Jehtae K, Srichana T. Evaluation of the wound healing potential of *Wedelia trilobata* (L.) leaves. J Ethnopharmacol. 2012;141(3): 817–824.
15. Tambe V, Nirmal S, Jadhav R. Central nervous system depressant activity of *Wedelia trilobata* leaves. J Pharm Sci. 1970; 6(1): 59–60.
16. Pulga HLG, Sanico FL. Phytochemical screening of *Sphagneticola trilobata* (*Wedelia*) plant extract. J. Bio. Innov. 2019; 8(2): 216-221.
17. Sushama RRV. Primary phytochemical investigation of *Sphagneticola trilobata* (L.) Pruski. Journal of Pharmacognosy and Phytochemistry. 2019; 8(1): 968-971.



AJPHR is
Peer-reviewed
monthly
Rapid publication
Submit your next manuscript at
editor@ajphr.com / editor.ajphr@gmail.com