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ABSTRACT

Sphaeranthus amaranthoides Linn is a small procumbent herb with spreading branches found in semi-aquatic environment. It belongs to the family, Asteraceae. In Tamil it is known as sivakaranthai. It is used as an energizer in siddha preparation. This plant was known for treatment of eczema, blood disorders, stomach worms, filaria, fever, skin diseases, anti-helminthes and jaundice. The reported activities were wound healing effect, antidiarrhoeal effect, antimicrobial effect, analgesic and anti-inflammatory activities, hepatoprotective effect, antidiabetic activity, antimutagenic activity and anti oxidant effect. The present review gives an overall view about the various activities reported on the plant.

Keywords: *Sphaeranthus amaranthoides* Linn, Pharmacological activity, Review, Macroscopy, microscopy

INTRODUCTION

Sphaeranthus amaranthoides Linn. is a small procumbent herb found in semi-aquatic environment. The leaves are palmately 3-foliolate with stems rooting and pubescent with appressed hairs. It belongs to the family Asteraceae. The plant is used in the treatment of eczema, blood disorders, stomach worms, filarial and fever. It also removes kapha, vata and piles. It is used to cure skin diseases [1]. The flowers of the plant have depurative, cooling and tonic effect. Seeds and root are used as stomachic and anti-helminthic [2]. Leaf powder is useful in the treatment of chronic skin diseases, urethral discharges, and jaundice [3]. Species of this plant are distributed widely in tropical Asia, Africa and Australia. In southern part of India particularly in Tanjore, Thirunelveli, Southern Mysore and Travancore area, it occurs as a weed of paddy field [4]. *Sphaeranthus indicus* is a related species in which a number of activities has been reported [5].



As per Bentham and Hooker Classification, *Sphaeranthus amaranthoides* belongs to

Plant kingdom-Dicotyledon class,

Sub class-Gamopetalae,

Series-Inferae

Order-Asterales

Family-Asteraceae

PHARMACOLOGICAL ACTION**Protective role on dermal wounds**

Wound is an injury which damages the normal tissue. Wound healing involves a number of biochemical and cellular processes. The initial stage is coagulation i.e., control of excessive loss of blood

from the damaged vessels. Second phase is inflammation and debridement of the wound. This is followed by re-epithelialization and finally collagen deposition and remodeling. A range of drugs from inexpensive analgesics to expensive chemotherapeutic agents are used for the management of wound healing.

Ethanollic extract of the aerial part of the plant is tested for its protective nature on excision wound model in wistar rats. Epithelization and wound contraction were studied. The results indicated reduction in wound area by the plant extract applied on the dorsal thoracic region the wistar rat. The rate of wound contraction is compared with that of standard framycetin sulfate [6]. Methanollic extract and flavanoid fraction of the whole plant of *Sphaeranthus amaranthoides* was also studied for their wound healing activity. Hydroxyproline level and collagen level of wounded area was found to be increased. The results were comparable with the standard silver sulfadiazine. Both extract and the flavanoid rich fractions accelerated the wound healing and repair [14].

Antidiarrhoeal effect

To wipe out the mortality rate in developing country due to diarrhea, WHO has conducted diarrhoeal disease control programme. Traditional medicine is accepted as an alternative form of health care.

Ethanollic extract of *Sphaeranthus amaranthoides* at two different doses like 200 and 400 mg/kg body weight exhibited a significant decrease in the diarrhea induced by castor oil in rats. The dose of 400 mg/kg showed an equivalent effect as that of 5 mg/kg of standard, diphenoxylate [7].

Antimutagenic assay

Ethanollic extract of the fresh leaves were used to study the antimutagenic activity. Sodium azide was used as a standard mutagen. The plant exhibited significant decrease in induced mutagenicity, tested with *E.coli* and *Staphylococcus aureus*, in both initial and final stages [8].

Antimicrobial effect

As there is an increase in microbial resistance to the available antibiotics, the research for antimicrobial herbal plant is also increasing.

Anti bacterial activity of the ethanollic extract of the plant by disc diffusion method showed that the extract was active against *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Proteus mirabilis*, *Enterococcus faecalis* and *Escherichia coli* at the concentration range between 50-400 µg/ml. Highest activity was observed against *E.coli* [7].

Ethanollic extract of the leaves of the plant was active against the bacteria like *Kpneumoniae*, *S. typhi*, *E.coli*, *P.aeruginosa*, *S.aureus* and

fungus *Anidulans*, *Aterreus*, *Asulphureus*, *Candida albicans* and *Fusarium* species. Acetone and water extract had no significant effect for *P.aeruginosa*, *Anidulans*, *Aterreus*, and *Fusarium* species. No extract was effective against *A.fumigatus* [8].

Aqueous extract of the leaves of the plant was effective against both *E.coli* and *P.vulgaris*. Various organic fractions of the plant exerted varying degree of responses. Alcoholic and petroleum ether fractions were found to be effective against *E.coli* and *P.vulgaris* showing zone of inhibition of 15 mm and 14 mm respectively [9].

Dilution of 50 µl/disc was found to be effective against bacterial strain such as *Streptococcus mutans*, *Staphylococcus aureus*, *Klebsiella pneumonia*, *Pseudomonas aeruginosa*. Just 10 µl/disc was found to be effective against *Escherchia coli*. But the effects were less when compared to the standard ciprofloxacin 50 µg/disc [10].

Analgesic and Anti-Inflammatory activities

The powder of leaves and inflorescences of the plant were used for this study. Indomethacin was used as a standard.

Analgesic effect was evaluated by tail flick hot water immersion method. Wistar albino rats even at a dose of 1000 mg/kg/p.o. produced only very weak analgesic activity.

Anti-inflammatory activity was evaluated by Carrageenan induced acute hind paw oedema method on Wistar albino rats. At a concentration of 1000 mg/kg/p.o, 95% inhibition was produced in the second phase of acute inflammation. This may be due to the inhibition of enzyme cyclooxygenase and subsequent prostaglandin synthesis. Therefore the plant exhibited a delayed anti inflammatory activity [10].

Hepatoprotective effect

D-galactosamine (β-D-GalN), a well known toxin, induces hepatitis in rat, similar to viral hepatitis. In India, there are number of medicinal plants used for treatment of hepatic disorders.

The aerial part of the plant was extracted with 95 % ethanol. In albino wistar rats, liver damage was induced by D-galactosamine. The ethanolic extract of the plant was given to the animal. The protective nature against the oxidative stress can be known from the regeneration of liver cell in animals pretreated with *Samaranthoides*. The altered antioxidant enzymes like CAT, SOD, GPx, GST, GSH, G6PD and GR were restored and a normal architecture of liver and mitochondria were regained. These results were correlated with silymarin, a known hepatoprotective compound. This showed the hepatoprotective effect of the plant [11].

Ethanolic extract of the aerial part of the plant was tested on drug metabolizing microsomal enzyme system. When compared to normal groups, in b- D-GalN injected rats, there was a drastic depletion in the enzyme activities of cytochrome p450, cytb5, and NADPH cytp450 reductase. But in animals fed with the ethanolic extract of the plant it was observed that the enzyme levels were restored to the normal value. Therefore this plant can be used to protect liver from drug induced toxication [12].

Antidiabetic Activity

Diabetes mellitus occurs due to lack of insulin secretion. Herbal drugs were used to treat number of diseases including diabetes mellitus. The use of nano science in conjunction with herbal medicine is acquiring more importance now. Silver nanoparticles were used as tropical ointment to act against burns and open wound.

The whole plant was extracted with ethanol and *Sphaeranthus amaranthoides* silver nanoparticles were prepared and characterized. The antidiabetic activity was explored by inhibition of α-amylase enzyme activity which is compared with the effect produced by the standard acarbose. IC 50 value of the plant was found to be 0.28 µg/ml [13].

Antioxidant activity

The antioxidant activity of the extract was evaluated by using 2, 2-diphenyl-1-picrylhydrazyl (DPPH) free radical scavenging method

and methanolic extract was found to possess activity comparable to that of butylated hydroxyl anisole followed by chloroform and acetone. Methanolic extract was found to contain more phenolic compounds and diethylether extract the least [14]. Antioxidant activity by ferric thiocyanate method for different extracts showed that methanolic extract was having more antioxidant potential when compared to ethanolic and aqueous extract. The effect produced by methanolic extract is comparable to that of ascorbic acid [8].

Phytochemical screening

Preliminary Phytochemical screening of the aqueous extract and other organic fractions like petroleum ether, benzene, chloroform and alcohol extracts of the root of the plant showed the presence of flavanoid, alkaloid, phenolic compounds, tannins and carbohydrates while the aqueous and petroleum ether extract of the leaves showed the presence of all the above mentioned phyto constituents along with phytosterol and saponin [7,9].

Fresh leaves were ground and extracted with petroleum ether. The extract was applied on a TLC plate and allowed to develop in a mixture of petroleum ether, isopropanol and water. The different pigments present in the leaf extract was found to be Caroteins, Chlorophyll b, Lutein Yellow, Violaxanthin, Pheophytin and Neoxanthin [8].

Macroscopic characters [10]

The plant is having spreading branches. Stem is 8 to 12 inches erect and glabrous. Leaves are 2 to 4 inches linear, oblong, narrowed at the base, decurrent, obtuse and serrulate. Flower heads are ½ to 1 inches, red in colour, occur in clusters, small, solitary ovoid in terminal.

Microscopic Characters [10]

The transverse section of the lamina of the leaf showed that it is dorsiventral. The upper epidermis is made up of nearly barrel shaped cells, below this is a layer of palisade mesophyll followed by spongy mesophyll composed of slightly lobed nearly isodiametric globular cells. Trichomes are simple club shaped glandular in nature. In between palisade and spongy mesophyll, occasional vascular bundles were seen. The lower epidermis is similar to the upper epidermis but the cells are smaller. The midrib shows arcuate collateral vascular bundles in the centre with 1 to 3 resin canals located on the abaxial side. Parenchymatous ground tissue is seen. The adaxial foliar epidermis consists of cells with slightly wavy margins. On both the sides, two types of stomata were seen namely ranunculaceous (anomocytic) and cruciferous (anisocytic) type.

CONCLUSION

The focus now is on the herbal drugs as they have less side effect and are easily available. So it is necessary that the active constituents responsible for these activities should be identified [15]. Even though this plant *Sphaeranthus amaranthoides* occurs as weed in paddy field, it is used as an important medicinal plant for a long period of time. Therefore it is necessary that we should explore the plant fully and find out the active constituents which are responsible for their different pharmacological uses.

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