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The Study on *Sphaeranthus indicus*

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Abstract

The increasing usage of plant-based medications is mostly due to their lower costs, greater efficacy, and little or non-existent adverse effects as compared to contemporary medications. To support the claims made about medicinal plants in traditional medicine systems, a great deal of research is being done on them. The Asteraceae family includes the aromatic herb Sphaeranthus indicus. It thrives as a weed in paddy fields and is found throughout India's lowlands and moist areas. This page summarizes the research that has been done on the pharmacological characteristics of S. indicus by different scientists. The entire plant as well as its anatomical parts have been shown to contain a variety of secondary metabolites, including eudesmanolides, sesquiterpenoids, sesquiterpene lactones, sesquiterpene acids, flavone glycosides, flavonoid C-glycosides, isoflavone glycoside, sterols, sterol glycoside, alkaloids, peptide alkaloids, amino acids, and sugars. The essential oils that were extracted from the flowers and whole plants were studied by several authors, who reported that several monoterpene hydrocarbons, oxygenated monoterpenes, sesquiterpene hydrocarbons, and oxygenated sesquiterpenes were present. The entire plant, its isolated secondary metabolites, and various anatomical parts have been reported to exhibit ovicidal, antifeedant, anthelmintic, antimicrobial, antiviral, macrofilaricidal, larvicidal, analgesic, antipyretic, hepatoprotective, antitussive, wound healing, bronchodilatory, mast cell stabilizing activity, anxiolytic, neuroleptic, immunomodulatory, anti-diabetic, antihyperlipidemic and antioxidant, antioxidant, central nervous system depressant, anti-arthritic, nephroprotective, anticonvulsant, and many other activities. It bears the colloquial names Mundi and East Indian globe thistle. It is a fragrant herb that spreads. It is native to the Rater area of the Chhindwara District in Madhya Pradesh and may be found in most of the tropical regions of the Garhwal Himalaya that are humid and moist.

Keywords: *Sphaeranthus indicus*, aromatic herb, ovicidal, antifeedant, antimicrobial, immunomodulatory, antihyperlipidemic, antioxidant

INTRODUCTION

One of the significant herbaceous medicinal plants in the Asteraceae family is *Sphaeranthus indicus (Linn.)* [1]. It is mainly found in moist areas, such as rice fields [2]. In Tamil, it is referred to as Kottakaranthai and in Hindi as Gorakhmundi. Native American medical systems have long utilized the entire plant, which has a wide range of therapeutic effects, to treat a wide range of conditions, including headache, jaundice, liver disease, diabetes, leprosy, fever, cough, gastritis, hernia, hemorrhoids, helminthiasis, dyspepsia, and skin disorders [3]. Plant-based medications are used to treat a wide range of disorders in traditional Indian healthcare systems like Ayurveda and Siddha, which are still in use today. These medications are well-liked by many because of their low side effects and efficacy [4].

Plant phytochemical analysis is a fascinating field of study that has produced the isolation of a

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number of unique chemicals. Certain chemical elements, such as different types of glycosides, tannins, phenolic compounds, lipids, fixed and volatile oils, resins, gums, mucilage, pectin, etc., are responsible for a drug's therapeutic efficacy and pharmacological effect. These phytochemicals are crucial to humankind [5].

BOTANICAL DESCRIPTION

Taxonomy

- Kingdom: Plantae
- Division: Phanerogamae
- Sub division: Angiospermae
- Class: Dicotyledonae
- Sub class: Gamopetalae
- Order: Asterales
- Family: Asteraceae
- Genus: *Sphaeranthus*
- Species: *indicus*

VERNACULAR NAMES

SI Linn. is Known by Different Names in Different Parts of India [6]

- Hindi: Gorakhmundi and Mundi.
- Sanskrit: Mahamundi, Shravani, Tapasvini, Mundi, and Hapus.
- Marathi: Barasavodi and Gorakhmundi.
- Bengali: Chagulnadi and Ghorkmundi.
- Gujarati: Bodiokalara, Mundi, and Dorakhmundi.
- Tamil: Kottakaranthai.
- Telugu: Boddatarupa and Boddasoram.
- Urdu: Kamdaryus.
- English: East Indian globe thistle.
- Malayalam: Adakkamanian, Attakkamanni, and Mirangani.
- Santal: Belaunja.
- Punjabi: Ghundi, Khamadrus, and Mundibuti.
- Undari: Mund.

SPECIES OF *SPHAERANTHUS*

Its species can be found widely throughout Australia, Africa, and tropical Asia. Additional species that have been documented are *Sphaeranthus moli, Sphaeranthus microcephalus* willd from Java, *Sphaeranthus laevigatus* wall from Africa, *Sphaeranthus suaveolens* DC from Africa, *Sphaeranthus hirtus* willd from France, and *Sphaeranthus senegalensis* from Switzerland [7].

SIDDHA PROPERTIES

S. indicus Linn. is used in The Siddha medical system is known as Kot.t.aikkarantai. The following is a list of other attributes that this system describes. It is one of the ingredients in "Veezhi Ennai (or Veezhi oil)", a preparation for Siddha [8]. Despite the fact that this herb is used in numerous preparations, the official literature only mentions this one.

- *Suvai* (Taste): *Kaippu* (Bitter).
- *Tanmai* (Potency): *Veppam* (Hot).
- *Gunam*: *Ilaku* (Soft).
- *Pirivu* (Transformation): *Kārppu* (Pungent).
- *Ceikai* (Action): *Uḷḷalalārri* (Demulcent), Ut.*arterri* (Restorative), *Puzhukkolli* (Anthelmintic), *Uramaakki* (Tonic).

AYURVEDIC PROPERTIES

- *Rasa: Madhura, Katu, Tikta, Kasāya.*
- *Guna: Laghu.*
- *Virya: Usna.*
- *Vipaka: Kat.u.*
- *Karma: Medhya, Vitaghna, Vātakaphahara, Arśadosa, Vināśaka* [9].

IMPORTANT AYURVEDIC FORMULATIONS

Navaratnarāja, Mt.gānka Rasa, Arka Muttī, Guduchyadi taila, Vatagajankusha rasa, Munditika churna, Guduchi taila etc. [9].

AYURVEDIC THERAPEUTIC USES

Medaroga, Apasmara, Kasa, Mutrakrcchra, Tvaka Roga, Stana Saithalya, Yonirogā, Āmātisara, Āmaroga, Vātaroga, Gudaroga, Plīhāroga, Chardi, Āmavāta, Gātradurgandhya, Sūryāvarta, Ardhāvabhāvabhedaka [9].

MORPHOLOGICAL CHARACTERS

It is an annual plant with many branches that is scented, growing 1–2 ft tall, and having winged stems and toothed wings. The leaves are serrated, dentate, oblong, and narrow at the base. Flowers compound heads, globose avoid, purple in color. In Indian conditions, flowering occurs from November to January; the plant is glandular hairy. The plant is abundantly found in India's plains and in hillsides up to a 50 ft elevation. Treating styptic stomach illnesses, skin diseases, anthelmintic, glandular swelling, nervous depression, analgesic, antibacterial, antifungal, laxative, and diuretic qualities are only a few of the many uses for this significant medicinal plant [10]. It is claimed that the plant's decoction effectively combats scabies, asthma, leukoderma, jaundice, and bronchitis. For treating piles, whey and powdered bark work well together [11, 12].

PHARMACOLOGICAL ACTIVITIES

Anxiolytic Activity

To evaluate the anxiolytic effect in mice, floral extracts in water (30 mg/kg), alcohol (10 mg/kg), and petroleum ether (10 mg/kg) were studied. Significant anxiolytic action was obtained by *S. indicus* floral petroleum ether extract [13]. The impact of hydroalcoholic extract of silicon dioxide (SI) on experimentally induced anxiety, depression, and convulsions in rodents was documented by Galani *et al*. [14].

Antioxidant Activity

Shirwaikar *et al*. exhibited *in vitro* antioxidant activity of ethanolic extract of SI (1000 µg/ml) [15]. Tiwari *et al*. described significant *in vivo* antioxidant activity of methanolic extract (ME) of SI. In the rats, there were decreased levels of malondialdehyde due to high levels of glutathione peroxides, superoxide dismutase, and catalase [13].

Neuroleptic Activity

The neuroleptic properties of floral extract were assessed in mice models of apomorphine-induced cage climbing and catalepsy. While the petroleum ether extract showed no catalepsy, both the aqueous and alcoholic extracts did [16].

Analgesic and Antipyretic

Nanda *et al*. proved that a whole plant extract in petroleum ether, chloroform, and ethanol had a strong analgesic effect that lasted for an hour and was comparable to that of diclofenac. After an hour, petroleum ether and chloroform extract also had a strong antipyretic effect that was similar to piracetam [17].

Activity that Modulates Immunity

The immunostimulant activity of sphaeranthanolide was assessed using the Jerne plaque assay method. This chemical was found to influence immunity. For mice with cyclophosphamide-induced myelosuppression, the only methanol fraction that was found to be beneficial in returning total white blood cell levels to normal was the residual fraction. On the other hand, it was discovered that the flower heads' methanol extract, petroleum ether, chloroform, and residual methanol fractions were useful in raising the levels of phagocytic activity, hemagglutination antibody titer, and delayed type hypersensitivity. Consequently, the research demonstrated the drug's potential as an immunomodulatory agent. It functions by enhancing humoral immunity as well as phagocytic and cellular immunity. The bioactive component boosts immoral and cell-mediated immunity in a dose-dependent manner and offers protection against immunosuppression caused by the cytotoxic agent. cyclophosphamide. It was discovered that the petroleum ether extract from the flower heads of *S. indicus* Linn. enhanced delayed type hypersensitivity, hemagglutination antibody titer, and phagocytic activity. The extract functions by inducing phagocytic function, humoral immunity, and cellular immunity [18].

Antiviral Activity

At a dosage of 0.4 μg/ml, the methanol extract was reported to have inhibitory effect against the *Herpes simplex* virus and the *Mouse corona* virus. Additionally, the plant exhibited antiviral activity against the Ranikhet and vaccinia viruses [19].

Antihyperlipidemic Activity

The alcoholic extract of flower heads in atherogenic diet induced hyperlipidemia in rats was investigated for the dose of 500 mg/kg/day, p.o. for 8 days. The extract effectively suppressed the hyperlipidemia by decreasing total cholesterol, triglyceride, LDL and very low density lipoprotein (VLDL); increasing the HDL [20].

Anti-Inflammatory Activity

The ethanolic extract's ability to reduce inflammation was assessed. The extract demonstrated dose-dependent and significant anti-inflammatory efficacy in both acute (carrageenan-induced hind paw edema, $P<0.05$) and chronic (cotton pellet granuloma development, $P<0.05$) models of inflammation when administered at different doses (100, 200, and 400 mg/kg, p.o.) [21].

Nephroprotective Effect

The ethanolic extract of SI Linn. was investigated for its nephroprotective properties in rats with acute renal failure caused by gentamicin [22].

Anti-arthritic Activity

Using dosages of 10, 30, and 100 mg/kg/day p.o., the anti-arthritic activity of the petroleum ether extract of the floral portion of SI Linn. was investigated [23].

Anthelmintic Activity

Pheretima posthuma and *Ascaridia galli* organisms were used to demonstrate the substantial anthelmintic action of ethanolic and aqueous extracts of SI. The greatest concentration, 100 mg/ml, exhibited the strongest effects against the two kinds of worms [24].

Antifeedant Activity

MESI exhibited antifeedant activity against *Spodoptera litura* larvae in their fourth instar. 7-hydroxy frullanolide, one of the substances extracted from this fraction, had strong antifeedant activity at 1,000 ppm. There were also visible abnormalities in the larvae, pupae, and adults [25].

Macrofilaricidal Activity

By using the worm motility assay method, the methanolic extract demonstrated macrofilaricidal activity (4 mg/ml) against adult *Setaria digitata*, the cattle filarial worm [19, 26].

Hepatoprotective Activity

Shirode *et al.* reported that the hepatoprotective activity of SI ethanol extract against rifampicin-induced liver damage [27].

Antiulcer Activity

Antiulcer activity of the ethanol extract of SI was screened using pylorus ligation, indomethacin, and ethanol-induced ulcer model [28].

Bronchodilatory Effect

In guinea pigs, the methanolic extract and its fractions, petroleum ether, benzene, chloroform, and ethyl acetate, had a notable protective effect against histamine-induced bronchospasm. Methanolic extract demonstrated significant protection that was on par with the usual dosage of chlorpheniramine maleate (2 mg/kg) [29] (Figures 1–3).

Traditional Uses of Plant

- Against piles [30].
- Cough.
- Mouth ulcer.
- Stomach ache.
- Leucorrhea [31].
- Gastric disorder.
- Jaundice [32].
- Skin diseases [31, 33].
- Diarrhea and dysentery [33].
- Eye infection.
- Toothache.
- Blood purifier [34].
- For retaining pregnancy.
- Rheumatic pain.
- Scabies [35–38].

Phytochemical Screening

- Test for Alkaloids,
- Test for Tannins.
- Test for Flavonoids.
- Test for Steroids.
- Test for phenol [39].

Marketed product of *Sphaeranthus indicus*

Figure 1. Gorakhmundi Capsules Dr Wakdes [40].

Figure 2. Tinefcon tablet [41].

Figure 3. Citokain capsule.

CONCLUSION

S. indicus L. possesses a range of pharmacological traits, according to a survey of the literature. Its properties are found to be comparable to benchmarks. On the other hand, little scientific data is available at this time on the extracts' mechanism of action, especially in relation to their ability to combat different kinds of illnesses. Thus, further investigation is needed to ascertain the molecular basis of *S. indicus* actions.

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