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Review Article

A Review Of Phytopharmacological Aspects Of *Sphaeranthus Indicus* Linn

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ABSTRACT

The study examines the pharmacognostical, physio-chemical, phytochemical, and pharmacological activity of Sphaeranthus indicus Linn, also known as Gorakhmundi, a fragrant herb used in Indian traditional medicine. The plant, found in India, Africa, Australia, Indo-Malesia, and Sri Lanka, has numerous medicinal properties, including antitussive, wound healing, bronchodilatory, antioxidant, and CNS depressant properties. The study focuses on evaluating plant materials through morphology, microscopic assessment, macroscopic evaluation, transverse section of leaf, and powder microscopy, Physicochemical tests were conducted to determine the presence of carbohydrates, proteins, flavonoids, fixed oils, alkaloids, steroids, and other substances in the extract. The purpose to study identification of active constituents of Sphaeranthus indicus,research and safety scientific studies support many of its traditional uses, though more research, especially clinical trials. The results indicate the presence of carbohydrates, proteins, glycosides, alkaloids, steroids, and other substances in the extract. Phenolic compounds in Sphaeranthus indicus have various pharmacological activities, including anticancer, antioxidant, microbiological, hepatoprotective, anti-diabetic, neuroprotective, immunomodulatory, antipyretic, and anti-inflammatory properties. The ethanol and petroleum ether extract of Sphaeranthus indicus showed effectiveness against Salmonella typhi, Pseudomonas aeruginosa, Escherichia coli, Klebsiella sp., Candida albicans, and Cryptococcus neoformans. Pharmacognostic analysis is crucial for identifying plant-based medications and provides valuable data for future research.

INTRODUCTION

The universe has supplied a vast supply of cures for human illnesses. Because they contain elements with therapeutic properties, medicinal plants have been utilized for ages as cures for many illnesses. 80% of people worldwide still primarily receive their medical treatment from

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conventional practitioners, according to the WHO. Currently, there is a growing interest in herbal medicines around the world, along with a rise in laboratory research into the pharmacological characteristics of bioactive ingredients and their potential to cure different ailments.(1) Gorakhmundi, often referred to as Sphaeranthus indicus Linn, is a fragrant, spreading herb that is a member of the Asteraceae family. It is widespread in India, growing in humid environments from the Kumaon highlands to Sikkim in the Himalayas, at heights of up to 1500 meters. This plant goes by several names, such as Mahashravani, Tapodhana, Munditika, Mundi, Shravana, Bhikshu, and Shravanashirshaka.(2) In the Indian system of medicine, the plant as a whole plant or its different parts like leaf, stem, bark, root, flower and seed are widely used for curing many diseases. The plant has been reported with different types of secondary metabolites such as eudesmanolides, sesquiterpenoids, sesquiterpene lactones, sesquiterpene acids, flavone glycosides, flavonoid C-glycosides, isoflavone glycoside, sterols, sterol glycoside, alkaloid, peptide alkaloids, amino acids and sugars. Essential oil has been isolated from flowers and whole plant. (3) The whole plant, its isolated secondary metabolites and different parts have been reported for 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 anti arthritic, nephroprotective, anticonvulsant activities and many other activities. It is also effective for psoriasis.(4) A range of secondary metabolites are present in different regions of Sphaeranthus indicus, such as Eudesmanolides, Sesquiterpenoids, Sesquiterpene lactones, Sesquiterpene acids, Flavone glycosides, Flavonoid C-glycosides, Isoflavone glycosides, Sterols, Sterol glycoside, Alkaloids, Peptide alkaloids, Amino acids, Sugars Due to research into ethnopharmacology and traditional remedies, a large number of medications have been brought to market. Ayurvedic medicine safety and practice require the establishment and validation of evidence, which will require work S.indicus Linn is one such therapeutic plant. The goal of the current investigation is to verify the medication using traditional scientific methodologies. (1)

PLANT PROFILE



Figure.1 Whole plant of Sphaeranthus indicus

Botanical Name	Sphaeranthus indicus
Family	Asteraceae
Kingdom	Plantae
Subkingdom	Viridaeplantae
Phylum	Tracheophyta
Subphylum	Euphyllophytina
Infra phylum	Radiatopses
Class	Magnoliopsida

Subclass	Asteridae
Order	Asterales
Genus	Sphaeranthus
Species	Indicus
Vernacular names	Mundi, ŚravaniKadamba, Puspika, Alambusta ,Kamadarus, Surmuriya, ChhagalNadi, Mudmudiya, Gorakhmundi, Mundi , Mirnagnee, Atookamanni, Mirangnee, Baras Bondi, Buikadam
Geographical distribution	Africa, Australia, Indo-Malesia, India , Sri Lanka
Morphological Characters	Much-branched, strongly scented, annual, erect plant with branched, tapering roots.
Stem	Cylindrical with toothed wings. Cork with 2 or 3 layers of parenchymatous cells covered with papillae cuticle having trichomes.
Leaves	Sessile, decurrent, 2-7 cm long, 1-1.5 cm wide. Obovate-oblong, rounded or subacute. Glandular-hairy, spinous serrate. Narrowed at the base, greenish-brown in color.
Flowers	Borne in terminal solitary clusters of heads. Heads of flowers are purple; bracts are short, slender, and acuminate. Each head has outer flowers that are female (few or many fertile), and central flowers that are bisexual (fertile or sterile), acute, and ciliate.
Roots	The outer side shows metaderm, a typical brown-colored tissue. Radial groups of pericyclic fibers and a few stone cells are seen.
Ethnomedical uses	Antitussive, Wound healing Activity, Bronchodilatory, Antioxidant Activity, CNS depressant , Nephroprotective Activity, Anticonvulsant Activity[5]

MATERIALS AND METHODS

PHARMACOGNOSTICAL EVALUATION STUDIES:

MACROSCOPIC EVALUATION STUDY:

The entire Sphaeranthus indicus Linn plant was observed macroscopically. It included things like size, form, texture, color, taste, consistency, odor, and surface features.

MICROSCOPIC EVALUATION STUDY:

Using a microscope, a transverse section of Sphaeranthus indicus's leaves, roots, and stem was collected.

The properties of Sphaeranthus indicus powder were examined.

PHYSIOCHEMICAL EVALUATION STUDIES

According to WHO criteria, the following physicochemical characteristics were determined: total ash value, sulphated ash, acid insoluble ash values, loss on drying, and sulphated ash.

DETERMINATION OF LOSS ON DRYING(LOD)

Weigh an empty, clean china dish and record its weight (W1). Weigh approximately 1.0 gram of the powdered drug into the weighed china dish. Record the combined weight of the china dish and the powdered drug (W2). Place the china dish with the drug in a hot air oven set at 105°C. Dry the sample until the weight difference between two consecutive weighings (after cooling in a desiccator) is not more than 0.5 mg. After drying, cool the china dish and sample in a desiccator to prevent moisture absorption from the air. Weigh the china dish with the dried sample and record the weight (W3) Calculate the percentage loss on drying (% LOD) with reference to the air-dried sample. (6)

FOR THE CALCULATION OF LOSS ON DRYING

As given the formula

PercentageLOD=(weight of before drying-weight of after drying)/(weight of the substance tobe taken)×100

DETERMINATION OF TOTAL ASH CONTENT:

Weigh the previously dried and weighed china dish (W1). Add the sample to the dish and weigh again (W2). Carefully heat the china dish over a small flame to char the material. This step helps in converting organic matter into carbon without losing any ash. Transfer the charred sample to a muffle furnace set at 550 ± 25°C. Maintain the temperature until a grey ash is obtained. This step ensures complete combustion of the organic matter, leaving only the ash. Cool the china dish containing the ash in a desiccator to prevent moisture Examine the ash to ensure it is carbon-free. If not, repeat the charring and ignition steps the dish from the desiccator and weigh it (W3). Repeat the heating, cooling, and weighing operations until two successive weighings do not differ significantly (within 0.001g). Record the lowest mass obtained. Calculate the Ash Content.(6)

DETERMINATION OF SULPHATED ASH :

Accurately weigh an empty, clean china dish (W1). Add 1.0 g of the powdered drug to the dish and weigh again (W2). Gently ignite the china dish until the substance is thoroughly charred, avoiding loss of ash. This step partially decomposes the organic matter. Cool the charred residue. Moisten the residue with 1 ml of sulphuric acid to help oxidize the remaining organic matter. Heat gently until white fumes are no longer evolved. This step ensures the oxidation of carbonaceous material. Place the china dish in a muffle furnace set at 800 ± 25°C. Maintain this temperature until black particles have disappeared, indicating the complete combustion of the organic material. Allow the china dish to cool. Add a few drops of sulphuric acid to the residue. Heat gently until white fumes cease and then ignite in the muffle furnace again. Allow the china dish to cool in a desiccator. Weigh the dish and record the mass (W3). Repeat the cooling, adding sulphuric acid, heating, and weighing steps until two successive weighings do not differ by more than 0.5 mg (0.0005 g). Record the lowest stable mass. Calculate the Ash Content.(6)

DETERMINATION OF ACID INSOLUBLE ASH:

The procedure described is a typical method for determining the total ash content of a sample. Add 25 ml of dilute hydrochloric acid (HCl) to the ashed sample in the china dish. Heat the mixture on a water bath for 10 minutes. Allow the mixture to cool. Filter the contents of the dish using appropriate filter paper. Wash the filter paper with water until the washings are free from acid (you can check the pH of the washings to ensure they are neutral). Once the filter paper is free from acid, return it to the china dish. Place the dish in an oven at 100 ± 2°C for 3 hours to dry the filter paper completely. Ignite the dried filter paper in a muffle furnace at 550 ± 25°C for one hour. After igniting, cool the china dish in a desiccator to prevent moisture absorption from the air. Repeat the cooling and weighing process until two successive weighings do not differ by more than a specified amount (usually 0.1 mg). Use the recorded mass to calculate the total ash content of the sample.(6)

FOR CALCULATION OF ASH CONTENT

As given the formula

$$\textbf{PercentageLOD} = \frac{\textbf{weight of before drying} - \textbf{weight of after drying}}{\textbf{weight of the substance tobe taken}} \times \textbf{100}$$

DETERMINATION OF TOTAL ASH CONTENT:

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FOR CALCULATION OF ASH CONTENT

As given the formula

Ash content= (weight of ash)/(weight of sample taken)×100

DETERMINATION OF ALCOHOL SOLUBLE EXTRACT:

5 g of coarsely powdered, air-dried drug is macerated with 100 ml of ethanol(at the specified strength) in a closed flask.The mixture is shaken frequently for the first six hours. It is then allowed to stand for the remaining eighteen hours.The mixture is filtered rapidly to avoid loss of solvent. 25 ml of the filtrate is taken. The 25 ml of filtrate is evaporated to dryness in a pre-weighed, flat-bottomed, shallow dish.The dish with the dried extract is then dried at 105ºC until a constant weight is achieved.The final step is to weigh the dried extract and calculate the percentage of alcohol-soluble extractive with reference to the weight of the air-dried drug.(6)

DETERMINATION OF WATER SOLUBLE EXTRACT:

5 g of coarsely powdered, air-dried drug is macerated with 100 ml of chloroform water in a closed flask. Shake the mixture frequently for the first six hours. Allow it to stand for the remaining eighteen hours. The mixture is filtered rapidly to prevent loss of solvent.25 ml of the filtrate is taken. The 25 ml of filtrate is evaporated to dryness in a pre-weighed, flat-bottomed, shallow dish.The dish with the dried extract is dried at 105ºC until a constant weight is obtained. Weigh the dried extract and calculate the percentage of chloroform-water soluble extractive with reference to the weight of the air-dried drug.(6)

FOR THE CALCULATION OF EXTRACTIVE VALUES

As per given formula,

% of extractive = weight of residue/weight of the drug x 100.

PRELIMINARY PHYTOCHEMICAL STUDIES

TEST FOR CARBOHYDRATES

Test For Carbohydrates	Procedure	Observation	Inference
Molish Test	Add 1 ml of naphthol solution to 2 ml of the extract. Add concentrated sulfuric acid through the side of the test tube.	A purple or reddish-violet color at the junction	presence of Carbohydrates
Fehling's Test	Add equal quantities of Fehling solution A and B to 1 ml of the extract. Heat the mixture.	Formation of a brick-red precipitate	Presence of reducing sugars
Benedict's Test	Add 1 ml of extract solution to 5 ml of Benedict's reagent. Boil for 2 minutes and then cool.	Formation of a red precipitate	Presence of Reducing sugars

TEST FOR PROTEINS

Test for Proteins	Procedure	Observation	Inference`
Biuret Test	Add 1 ml of 40% sodium hydroxide solution and 2 drops of 1% CuSO4 solution to 1 ml of the extract.	A pinkish or purple-violet colori	Presence of Proteins
Nin hydrin test	Add two drops of 0.2% Ninhydrin reagent to a small quantity of extract solution and heat.	Development of a blue color	Presence of proteins, peptides, or amino acids.

TEST FOR FLAVONOIDS

Test for Flavonoids	Procedure	Observation	Inference
Shinoda's Test	Treat the alcoholic extract of the powder with magnesium foil and concentrated HCl.	An intense cherry red colour	Presence of flavanones
		an orange-red color	Presence of flavonols.

TEST FOR FIXED OILS

Test For Fixed Oils	Procedure	Observation	Inference
Spot Test	Press a small quantity of extract between filter paper.	Oil stains on the paper	Presence of fixed oils.
Saponification Test	Add a few drops of 0.5 N alcoholic potassium hydroxide and a drop of phenolphthalein to 1 ml of the extract. Heat on a water bath for 1-2 hours.	Formation of soap	Presence of fixed oils and fats.

TEST FOR GLYCOSIDES

Test for Glycosides	Procedure	Observation	Inference
Legal Test	Dissolve the extract in pyridine and add sodium nitroprusside solution to make it alkaline.	A pink-red to red color	Presence of glycosides
Baljet Test	Add 1 ml of sodium picrate solution to 1 ml of the extract.	A yellow to orange color	Presence of glycosides.
Borntrager's Test	Add dilute sulfuric acid to 1 ml of the extract solution, boil, filter, and extract the filtrate with chloroform. Treat the chloroform layer with 1 ml of ammonia.	A red color in the ammoniacal layer	Presence of anthraquinone glycosides
Keller-Killiani Test	Extract 1 g of powdered drug with 10 ml of 70% alcohol, filter, add 10 ml of water and 0.5 ml of strong lead acetate solution, filter again, and shake the filtrate with 5 ml of chloroform. Separate the chloroform layer, evaporate gently, dissolve residue in 3 ml of glacial acetic acid containing 2 drops of 5% ferric chloride solution. Transfer to 2 ml of concentrated sulfuric acid.	A reddish-brown layer forms at the junction, and the upper layer becomes bluish-green.	Presence of anthraquinone glycosides

TEST FOR ALKALOIDS

Test for alkaloids	Procedure	Observation	Inference
Dragendorff's Test	Add 1 ml of Dragendorff's reagent to 1 ml of the extract.	An orange-red precipitate	Presence of alkaloids.
Mayer's Test	Add 1 ml of Mayer's reagent to 1 ml of the extract.	Whitish-yellow or cream-colored precipitate	Presence of alkaloids.

Hager's Test	Add 3 ml of Hager's reagent to 1 ml of the extract.	Yellow-colored precipitate	Presence of alkaloids.
Wagner's Test	Add 2 ml of Wagner's reagent to 1 ml of the extract.	Reddish-brown precipitate	Presence of alkaloids.

TEST FOR STEROIDS

Test for steroids	Procedure	Observation	Inference
Libermann-Burchard Test	Dissolve 1 g of the test substance in a few drops of chloroform, add 3 ml each of acetic anhydride and glacial acetic acid, warm and cool under the tap, then add drops of concentrated sulfuric acid.	Bluish-green color.	Presence of sterols
Salkowski Test	Dissolve the extract in chloroform and add an equal volume of concentrated sulfuric acid.	Bluish-red to cherry color in the chloroform layer	Presence of steroids
		green fluorescence in the acid layer	Presence of steroids

PHARAMACOLOGICAL ACTIVITY

ANTICANCER ACTIVITY

Compounds:

Sphaeranthanolide, flavonoids, terpenoids

Effects:

Inhibit the growth of various cancer cell lines, including breast and colon cancer cells.(8)

ANTI-OXIDANT ACTIVITY

Compounds:

Flavonoids (quercetin, luteolin), phenolic acid (chlorogenic acid), glycosides

Effects:

Significant free radical scavenging activity, protecting cells from oxidative damage.(8)

ANTI-MICROBIAL ACTIVITY

Compounds:

Extracts of Sphaeranthusindicus

Effects:

Active against a variety of bacterial and fungal pathogens, including Staphylococcus aureus and Candida albicans.(8)

HEPATOPROTECTIVE ACTIVITY

Compounds:

Sphaerathuside, flavonoids, terpenoids

Effects:

Protect liver cells from toxin damage, improving liver function.(8)

ANTI-DIABETIC ACTIVITY

Compounds:

Chlorogenic acid, other phenolic compounds

Effects:

Reduce blood glucose levels, improve glucose tolerance.(8)

NEUROPROTECTIVE ACTIVITY

Compounds:

Flavonoids (quercetin, luteolin), phenolic acids

Effects:

Protect against neurodegenerative diseases by reducing oxidative stress and inflammation in neural tissues. (8)

IMMUNOMODULATORY ACTIVITY

Compounds:

Flavonoids, terpenoids

Effects:

Modulate immune responses, potentially beneficial in autoimmune conditions and immune deficiencies.(8)

ANTI-PYRETIC ACTIVITY

Compounds :

Flavonoids, other anti-inflammatory compounds

Effects :

Reduce fever in animal models comparable to standard anti-pyretic drugs.(8)

ANTI-INFLAMMATORY ACTIVITY

Compounds::

Sphaeranthanolide, flavonoids (quercetin, kaempferol), phenolic acids (caffeic acid)

Effects:

Inhibit pro-inflammatory cytokines and enzymes such as COX and LOX(8)

ANTIOXIDANT ACTIVITY

The free radical DPPH is rather stable. The evaluation of an antioxidant's capacity to scavenge the stable radical DPPH is the foundation of the experiment. Based on the principle of antioxidants, S. indicus reduces the radical to the matching hydrazine when reacting with a hydrogen donor. The solution loses color stereometrically in relation to the quantity of electrons taken up when DPPH radicals react with an appropriate reducing agent and pair off their electrons. Based on the phosphomolybednum complex formation, which was detected spectrophotometrically at 695 nm, the extract's overall antioxidant capability was determined. Flavonoids are natural products that have been demonstrated to exhibit a number of biological properties connected to the process of antioxidant action. Because of the flavonoids and other ingredients it contains, sphaeranthus indicus has antioxidant properties.(9)

IMMUNOODULATORY ACTIVITY

In tests on mice, the petroleum ether extract from the flower heads of Sphaeranthus indicus Linn. was found to be beneficial in boosting phagocytic activity, hemagglutination antibody titer, and delayed version hypersensitivity. To determine a dose-response relationship, the petroleum extract's activity was evaluated at five different dosage levels. It was discovered that the ideal dose was 200 mg/kg; at larger levels, the activity either decreased or did not rise at all. According to the current study, the medication has a lot of potential as an immunomodulatory agent because it promotes phagocytic function, humoral and cellular immunity, and both.(9)

PSYCHOTROPIC ACTIVITY

Strong neuropharmacological activity has been observed in the hydroalcoholic extract of S.indicus.The pentobarbital-induced hypnosis was extended, and spontaneous motor activity was greatly decreased by the hydroalcoholic extract of Sphaeranthus indicus. Perhaps it is acting as a light sedative. Additionally, Sphaeranthus indicus hydroalcoholic extract decreased.(9)

ANTIMICROBIAL ACTIVITY

The Sphaeranthus indicus chloroform extract has shown slightly greater efficacy than the ethanol and petroleum ether extracts against Escherichia coli, Pseudomonas aeruginosa, Salmonella typhi, Klebsiella sp., Candida albicans, and Cryptococcus neoformans. Asthma, diarrhea, leucoderma, and indigestion are among the conditions for which the plant is said to be therapeutic. Researchers extracted a novel sesquiterpene glycoside, sphaeranthanolide, and isoflavone glycoside from S. indicus leaves and flowers. These compounds were discovered to be immunological stimulants. Treatments for skin diseases, coughs, and fevers include S.indicus, according to medical knowledge from tribal

healers. Pile treatment is reportedly effective when the bark is crushed and combined with whey. Thin layer chromatographic separation produced the active constituent 7 hydroxyfrullanolide, and the chloroform extract of leaves in this investigation demonstrated strong action against the chosen human infections. This substance, which is classified as sesquiterpenes, was extracted from a floral portion of Spaeranthus indicus. It is possible to analyze this herb's composition for the treatment of many ailments, such as cancer and skin conditions, and to create a herbal medication since it has a wide spectrum of therapeutic value.(9)

ANTIDIABETIC ACTIVITY

In rats administered streptozotocin (STZ) (60 mg 〖kg〗^(-1) i.p.) and nicotinamide (120 mg 〖kg〗^(-1)) to induce diabetes, we examined the potential antihyperglycemic effects of Sphaeranthus indicus extract. Normal and diabetic rats were used to assess fasting plasma glucose levels, serum insulin levels, serum lipid profiles, magnesium levels, glycosylated hemoglobin, changes in body weight, and liver glycogen levels. After taking S. indicus orally for 15 days, there was a notable drop in blood glucose levels and an increase in liver glycogen and plasma insulin. When given the alcoholic extract of S. indica, rats that were fasting and not diabetics showed a notable improvement in the oral glucose tolerance test. The reference standard that was employed was glibenclamide. The results show that Sphaeranthus indicus extract, which is alcoholic, may have potential benefits in the management of diabetes.(9)

ANTIHYPERLIPIDEMIC ACTIVITY

Serum TC and LDL-c levels increased, but cholesterol levels decreased. The animal fed an atherogenic diet had elevated HDL levels. The main risk factor for coronary heart disease (CHD) was elevated blood cholesterol, with HDL serving as a cardioprotective lipoprotein. The levels of TC and LDL-c are dramatically reduced by treatment with 500 mg/kg/day of Sphaeranthus indicus extract. Lecithin's increased activity might be the cause of the Sphaeranthus indicus extract's effects. The TG level decreased when Sphaeranthus indicus extract (500 mg/kg/day) was administered. LDL:HDL-c ratio and atherogenic index were significantly lower. Both high and low blood cholesterol levels may be predicted by the LDL:HDL-c ratio, and the most significant marker of coronary heart disease (CHD) is the atherogenic index. Strong antihyperlipidemic effects are demonstrated by the alcoholic extract of Sphaeranthus indicus. (9)

ANXIOLYTIC ACTIVITY

The animals that were given extracts or diazepam (1 mg/kg) displayed increased walking, activity in the center of the test, and total locomotion; they also showed decreased bouts of fighting in the foot-shot-induced aggression, which suggested anxiolytic activity; and finally, they showed an increase in the time spent, percent entries, and total entries in the open arm of the elevated pulse maze (EPM). Three extracts from the flowers of Sphaeranthus indicus produced significant activity in the mice: petroleum ether (10 mg/kg), alcoholic (10 mg/kg), and water (30 mg/kg). The EPM and OFT showed a greater anxiolytic effect from petroleum ether extract (10 mg/kg) compared to ethanolic and water extracts; however, it was not as strong as that of diazepam (1 mg/kg).(9)

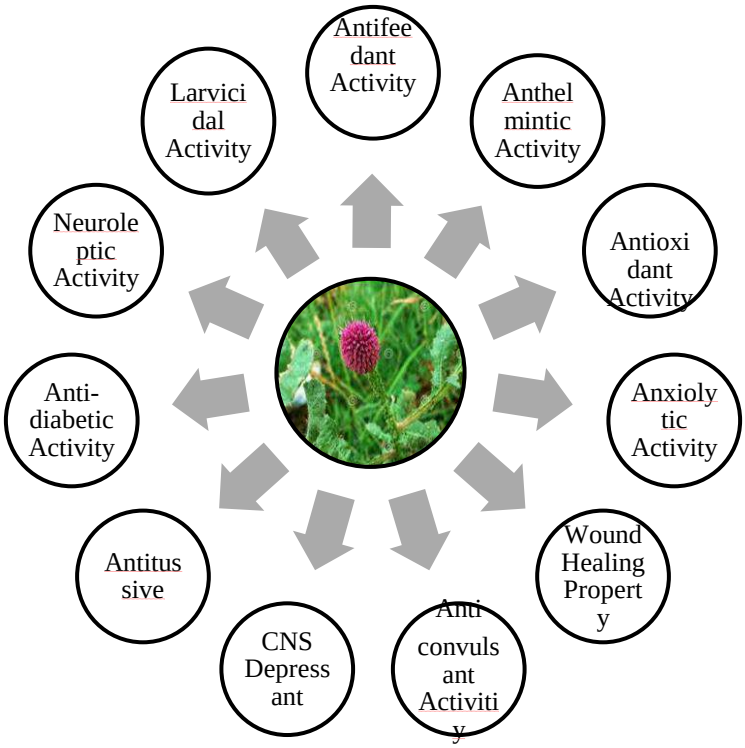


Fig :2 Pharmacological activities of sphaeranthus indicus Linn

RESULTS AND DISSCUSSION

PHARMACOGNOSTICAL EVALUATION STUDIES:

The primary and most trustworthy criterion for identifying plant-based medications is the pharmacognostic analysis. The pharmacognostical characteristics are required for identification verification as well as for assessing the crude drug's quality and purity. The comprehensive and methodical pharmacognostic assessment would provide important data for subsequent research.

Macroscopic Evaluation:

Colour	Green
Odour	Characteristic Odour
Taste	Pungent Taste
Leaf Attachment	Sessile
Leaf Shape	Obovate –Oblong
Leaf Apex	Tapered & Pointed
Leaf Base	Tapered
Leaf Margin	Dentate
Leaf Texture	Simple & Serrate
Leaf Surface	Glabrous
Leaf Size	Length: 1.5- 4.5 Cm Width :2.5 Cm

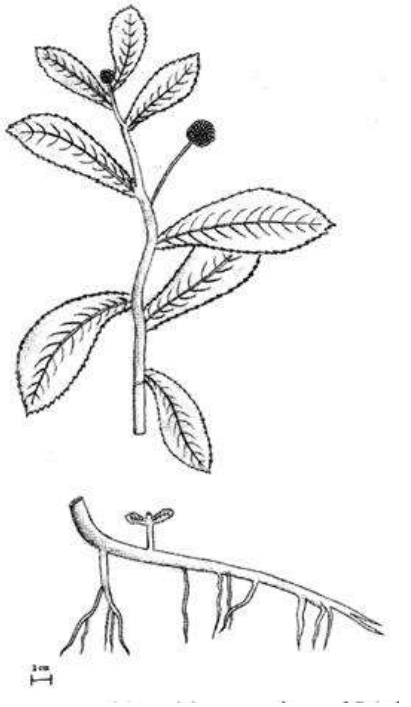


Fig.3: Macroscopy of Sphaeranthus indicus Linn.,(10)

MICROSCOPIC EVALUATION

TRANSVERSE SECTION OF LEAF

The leaf is dorsiventral and exhibits an extensive number of various sorts of trichomes on both the epidermis. Simple trichomes have thick walls, three to four cells, with dimensions of 130.8–145.2 µm in length and 29.0–43.5 µm in breadth. Trichomes have a straight or knee-shaped shape, a swelling base, and a collapsed cell in the center or at the tip. Three or four collateral vascular bundles connected to a cluster of sclerenchymatous cells on either side can be seen in the midrib.

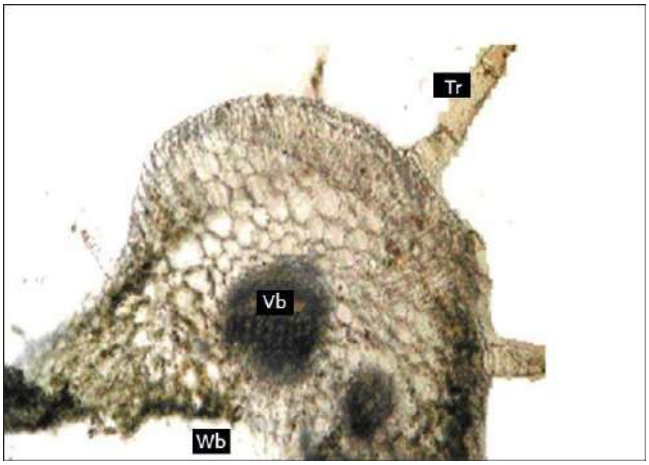


Fig no 4Transverse section (T.S.) of leaf of S. indicus. Mb, midrib; Tr, trichome; Vb, vascular bundle, Cleared with chloralhydrate. magnification ×10 × ×10 (5)

TRANSVERSE SECTION OF STEM

A discontinuous ring of lignified pericyclic fibers and a well-developed ring of bicollateral vascular bundle around the pith are characteristics of the stem that indicate cork with two to three layers of parenchymatous cells covered with papillose cuticle possessing trichomes. Pitted and lignified, medullary rays are approximately unitetraseriate.

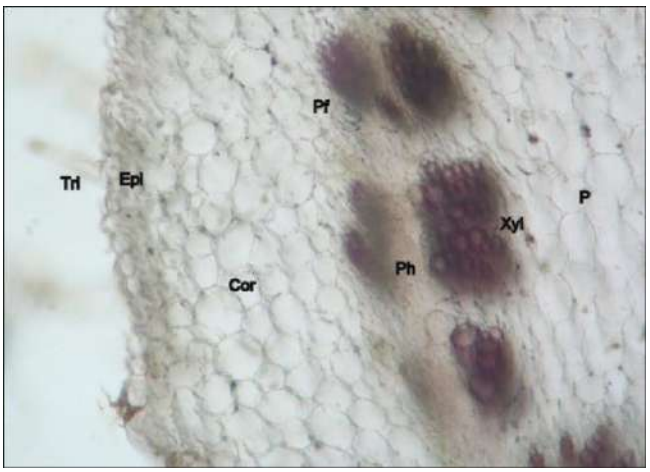


Fig: 5 T.S. of stem of S. indicus. P, pith; Xyl, xylem; Ph, phloem; Pf, pericyclic fibers; Cor, cortex; Epi, epidermis; Tri, trichome, Stained with fluoroglucinol and HCl Magnification: ×10 × ×45 (5)

TRANSVERSE SECTION OF ROOT

On its exterior surface, the root displays the characteristic brown tissue known as the metaderm. Forming an uneven layer, it is made up of suberized cells that act as a barrier. The secondary cortex has radially distributed secretory canals that alternate with radial groupings of pericyclic fibers and a few stone cells. Radially oriented parenchymatous phloem is present. Two to five seriate, lignified, and pitted medullary rays are present.



Fig:6 T.S. of root of S. indicus.Mr, medullary rays; Xyl, xylem; Pf, pericyclic fibers; Cor, cortex; Mt, metaderm, Stained with fluoroglucinol and HCl Magnification: ×10 × ×45 (5)

POWDER MICROSCOPY



Fig.07: General features of Sphaeranthus indicus linn.,

1. Habit
2. Flowering Twig
3. Crude Drug
4. T.S Of Leaf Through Midrib
5. Stele Enlarged
6. Vascular Bundle
7. Portion Showing Trichomes
8. Portion Of Lamina Showing Palisade And Spongy Parenchyma
9. Venation Pattern
10. Stomata Enlarged
11. T.S. Of Stem Showing Various Regions
12. Portion Showing Epidermis And Cortex
13. Portion Showing Vascular Bundle
14. Pith Cells
15. Druse Type Crystal In Pith Cells
16. Pitted Parenchyma
17. T.S Of Root Showing Various Regions
18. Portion Showing Cork And Sec. Cortex
19. Secondary Cortex Showing Oil Globules
20. Secondary Phloem Showing Oil Globules
21. Secondary Xylem Showing Vessels And Medullary Rays
22. Medullary Rays With Pits

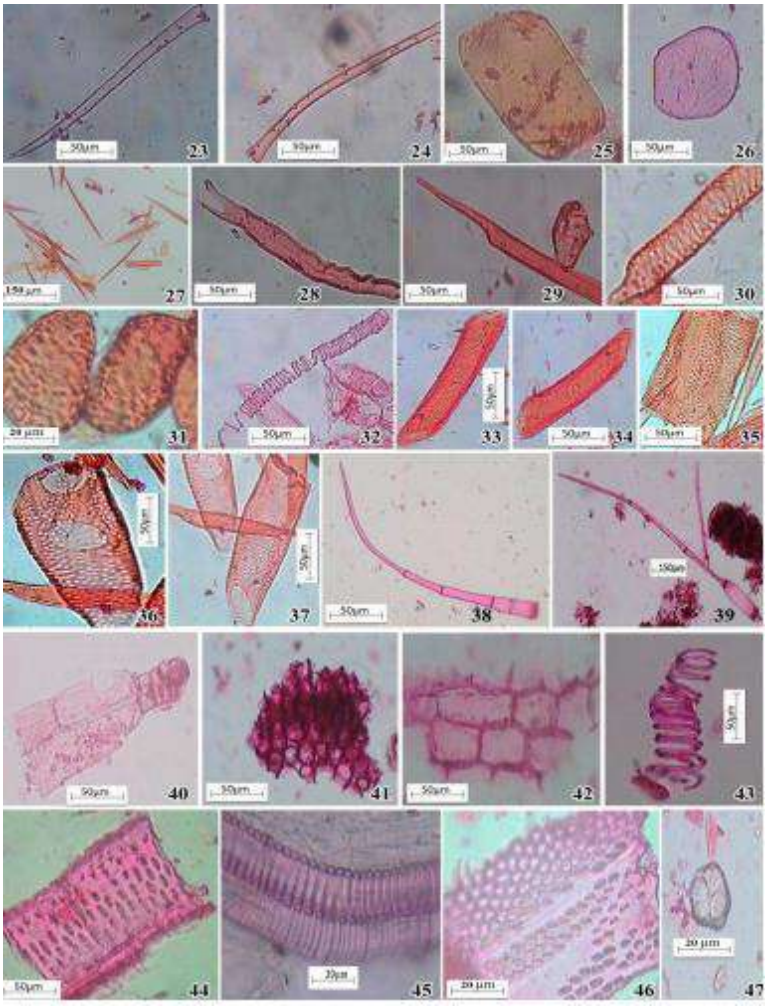


Fig:08 Powder Microscopy of Sphaeranthus indicus Linn.,(11)

Macerate elements

23- 24. Fragments Of Trichome
25-26. Parenchyma Cells
27. Group Of Fibres
28. Fibre With Forked End
29. Fibre With Drawn Out End
30. Tracheid
31. Pitted Parenchyma
32. Vessel With Spiral Thickenings
33-35. Vessels With Pitted Thickenings
36-37. Vessels With Terminal And Sub Terminal Opening

Powder Characters

38-39. Multicellular Covering Trichomes
40. Glandular Trichome
41. Cork Cells
42. Parenchyma Cells
43. Vessel With Spiral Thickenings
44. Vessel With Simple Pits
45. Vessel With Scalariform Thickenings
46. Vessel With Bordered Pits
47. Druse Type Of Crystals

PHYSIOIOCHEMICAL EVALUATION STUDIES

Standards for crude pharmaceuticals can be set with the use of the quantitative determination of some pharmacognostical factors. In order to identify drug adulteration or inappropriate management, it is crucial to continuously evaluate the drugs physically. The medication may inhibit the growth of bacteria, fungi, or yeast because its moisture level is not excessively high. Determining the ash value and acid-insoluble ash

value is equally significant in the assessment of crude medicines. Total ash, or the presence or absence of foreign inorganic materials such metallic salts and/or silica, is particularly significant for evaluating the purity of pharmaceuticals. Sphaeranthus indicus Linn crude powder analysis physicochemical parameter data are shown in the table.

Table 1. The average values are expressed as percentage of air-dried material

S. NO	PARAMETERS	RESULTS (% w/w)
01.	Loss of drying	1.09
02.	Total ash value	9.21
03.	Sulphated ash value	8.00
04.	Acid insoluble ash value	1.35
05.	Alcohol soluble extractive value	3.7
06.	Water soluble extractive value	19.86

PRELIMINARY PHYTOCHEMICAL STUDIES OF Sphaeranthus indicus Linn.,

Alkaloids, flavonoids, sugars, proteins, tannins, steroids, and saponin glycosides were found, according to a preliminary screening of phytochemicals.

Table 2 . Preliminary Phytochemical Analysis Of Sphaeranthus Indicus Linn.,

S. NO.	Secondary Metabolites	Results(Presence/Absence)
01.	Carbohydrates	-
02.	Proteins	-
03.	Tannins	-
04.	Alkaloids	+
05.	Steroids	-
06.	Saponin Glycosides	-
07.	Flavonoids	-

Results : +presence/- absence

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