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PHYSICOCHEMICAL AND PHYTOCHEMICAL EVALUATION OF GORAKHAMUNDI *(SPHAERANTHUS INDICUS LINN)* WHOLE PLANT

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ABSTRACT

Sphaeranthus indicus Linn. Commonly known as "*Gorakhmundi"* or East Indian Globe Thistle. It is an annual herb which grows upto 30 cm. height & flowers are violet coloured. *Gorakhmundi* mentioned in various ayurved classics having many therapeutic qualities and it is widely use in many formulations in medical practices. Present study aims at development of quality standards for the *Spheranthus indicus linn* (whole plant) sample utilizing to investigate macroscopic, microscopic, phytochemical & physicochemical parameter of Gorakhmundi (*Sphaeranthus indicus Linn.*) whole plant .An establishment of pharmacognostic standard on identification, purity, quality and classification of herbal plant required. Microscopic characteristics were observed under a light microscope. Phytochemical analysis was done as per SOPs to detect various chemical components. Physicochemical properties including total ash value, acid insoluble ash, water soluble and alcohol soluble extractive were determined. These findings will be useful towords establishing pharmacogenetic standards on identification, purity, quality and classification of the plant drug research.

KEYWORDS: *Sphaeranthus indicus Linn., Gorakhmundi,* Phytochemical & Physicochemical Evaluation, Pharmacogenetic standardization.

INTRODUCTION

Dravyaguna is a branch of *Ayurveda* that focuses on the properties and actions of drug

particularly herbs and Ayurvedic formulations. It encompasses scientific knowledge related to these substance, including their nature, names, properties, and pharmacological effects. This field delves into pharmacognosy, which is the study of meditional plants, and pharmacology, the study of drug actions. It also explores the therapeutic uses of *Ayurvedic* medications, providing valuable insights into their efficacy and applications in healthcare. *Spheranthus indicus Linn.* Asteraceae family known as *Gorakhmundi* in *Marathi*. It is annual herb which grows upto 30 cm height. It's flowers are violet coloured. *Gorakhmundi* possess *Tikta, Katu, Madhur rasa*, *laghu, ruksha guna, usna virya & katu vipak* as therapeutic property. It is used in disease like *Ardhavabhedak. Suryavarta, Apasmar, Apachi, Shleepada. Gorakhmundi* loaded with wealth of bioactive compounds which deliver health benefiting properties. It is *Medhya Tridoshshamak, Rasayana,*. The established pharmacological activities of *Gorakhmundi* include antimicrobial, anti-inflammatory, analgesic, antipyretic, antidiabetic, hepatoprotective, anxiolytic, anti-convulsant and many other activities.[1,2,3]

Botanical Name: *Sphaeranthus indicus Linn.*

Family: Asteraceae.

Vernacular Names[4,5,9]

Sanskrit	Mahamundi, Shravani, Mundi
Hindi	Gorakhmundi, Mundi
Marathi	Barasavodi, Gorakmundi
Bengali	Chagulnadi, Gorkhmundi
Gujarati	Bodiokalara, Mundi,Gorakhmundi
Telugu	Boddatarupa, Boddasram
Urdu	Kamdaryus
Malayalam	Adakkamanian, Attakkamanni, Mirangani
Punjabi	Ghundi, Khamadrus, mundibutti
English	East Indian globe thistle

Characteristics

Rasa - Tikta, Katu, Madhur; **Vipak –** Katu; **Virya –** Ushna.

Karma: Tridosa hara; Medhya; Rasayana.

Rogadhikar: Galganda, Apachi, Mutrakruccha, Krimiroga, Yoniroga, Pandu, Shleepada, Apasmar**.**

Classical categorization: Guducyadi varga[3]

MATERIAL AND METHOD

Plant Material Collection: Sample of *Sphereanthus indicus Linn.* were collected from my own farm - Sonegaon (Bora), Th.- Tirora, Dist. Gondia. Plant material that is whole plant were dried in shed and ground to a coarse powder.

Macroscopic Analysis: The whole plant was studied macroscopically for important identification points i.e. odour, taste, and texture & for microscopic studies. It is a technique of qualitative evaluation based on the study of morphological and sensory profile of whole drug.

Botanical description[6,8,9]

Habit: A much branched, diffuse, annual herb.

Steam: Woody at the base; branches upto 25 cm tall; cylindrical with toothed wings, more or less hispid, glandular hairy.

Leaves: Alternate, exstipulate, sessile, with lamina running down over the stem, decurrent, lamina simple, oblong, obvate, rounded, or sub-acute, margins serrate, dentate, spinous, glandular hairy 0.5-5 × 0.2 – 2.5 cm.

Inflorescence: Heads terminal, small, many, globose ovoid on the solitary glandular peduncle, with toothed wings, heterogamous, purple.

Flowers: Outer ray florets - Incomplete, unisexual, female, regular, actinomorphic, few or many fertile.

Calyx - Absent; **Corolla** – petals 5, united, tubular, minutely 2-3 toothed; **Androecium –** Absent.

Gynoecium: Carpels 2, ovary inferior, syncarpous, unilocular with single basal ovule style filiform, stigma bifid.

Disc florets: Incomplete, bisexual, regular, actinomorphic, epigynous, bractate.

Calyx: Absent; **Corolla:** Petals 5, united, tubular, limbs 4-5.

Androcium: Stamens 5, epipetalous, alternating with petals, anther sagittate, auricles acute.

Gynaecium: Carpels 2, ovary inferior, syncarpous, unilocular with single basal ovule, style filiform, stigma bifid.

Fruit: Cyspela, oblong compressed.

Taxonomic Position

Kingdom	Plantae
Subkingdom	Viridaeplantae
Phyllum	Tracheophyta
Subphyllum	Euphyllophytina
Infraphyllum	Radiatopses
Class	Magnoliopsida
Subclass	Asteridae
Superorder	Asterinae
Order	Asterales
Family	Asteraceae
Genus	*Sphaeranthus*
Species	*indicus*

Microscopic Study: A transverse section was prepared and stained. This method allows more detailed examination of the drug and it can be used to identify the organized drug by their known histological characters. It is mostly used for qualitative evaluation of organized drug by their known histological characters. It is mostly used for qualitative evaluation of organized crude drug in entire and powdered form.

Leaf: The leaf is dorsoventral and shows abundant trichomes of varying types on both the epidermis. Simple trichomes are three to four celled, thick walled and measure 130.8–145.2 µm in length and 29.0–43.5 µm in width. Trichomes are straight/knee shaped, with a swollen base and with collapsed cell at the middle or at the apex. Midrib shows three to four collateral vascular bundles associated with a group of sclerenchymatous cells on either side.

Stem: The stem shows cork with two to three layers of parenchymatous cells covered with papillose cuticle having trichomes and can be distinguished by the presence of a discontinuous ring of lignified pericyclic fibers and a well-developed ring of bicollateral vascular bundle surrounding the pith. Medullary rays are pitted, lignified and about unitetraseriate.

Root: The root shows on its outer side metaderm, a typical brown colored tissue. It consists of suberized cells, arranged irregularly and forms a protective layer. Radial groups of pericyclic fibers and few stone cells are seen alternating with radially arranged secretory canals in the

secondary cortex. Phloem is parenchymatous and radially arranged. Medullary rays are pitted, lignified and about two to five seriate.

Parts used: Whole plant, seeds, flowers and roots.

Ayurvedic preparations: Mundi churna, mundi panchang swarasa, mundi kwatha.

Physicochemical study: The physicochemical parameters are necessary for confirmation of the identity and determination of quality and purity of crude drugs, quality of drug can be assessed with this analysis and thus biochemical variations, adulterations, substitutions, effect of storage / treatment occurring in it can be tested, Physicochemical studies such as the moisture content/loss on drying ash value, acid insoluble ash, water soluble ash, acid soluble ash, water soluble extractive, alcohol soluble extractive and pH of powdered sample were done according to the SOPs given by API.[4,7,10] The raw drug was heated in muffle furnace to obtain the white ash. The white ash was then subjected to various chemical analysis to determine the presence of heavy metals.

Table 1: Obeservations of Physico-chemical Analysis.

Parameter Studied	Observed Value	Permissible range as per API
Loss on drying	0.68 %	Not more than 1 %
Alcohol – soluble extractive	8.90% w/w	Not less than 2 %
Water soluble extractive	9.10 % w/w	Not less than 6 %
Total ash	18.2 % w/w	Not more than 23 %
Acid insoluble ash	5.9 % w/w	Not more than 9 %

Phytochemical analysis

Six solvents Aqueous, Hydra-alcoholic, Methenol, Ethenol, Chloroform, Ether were used to prepare extract. 5 gm of dried powderd drug was mixed with 50 ml solvent, stirred for 6 hours and then kept steady for next 18 hr. filtered and used to perform chemical test for primary phytochemical analysis as per standard guidelines.[4,7]

1. **Test for Carbohydrates**

a) **Molisch's test:** Add few drops of alcoholic α-naphthol to the test solution, then add few drops of conc. H_2SO_4 through the sides of test tube, purple to voilet colour ring appears at the junction.

2. **Test for Proteins**

a) **Xanthoproteic test-** To the 5ml of test solution, add 1 ml of concentrated nitric acid and boil, yellow precipitate is formed, after cooling it, add 40% sodium hydroxide solution, orange colour appears showing proteins presence.

3. **Test for Alkaloids**

a) **Mayer's test-** Alkaloids gives cream coloured precipitate with Mayer's reagent (Potassium mercuric iodide).

b) **Wagner's test-** Alkaloids gives reddish-brown precipitate with Wagner's reagent (Iodine potassium iodide).

c) **Hager's test-** Alkaloids gives yellow precipitate with Hager's reagent (Saturated solution of picric acid).

4. **Test for Flavonoids**

a) **Shinoda test-** Add few magnesium turnings and conc. HCl acid dropwise to the test solution, pink scarlet, crimson red or occasionally green to blue color appears after few minutes.

b) **Alkaline reagent test-** Add few drops of sodium hydroxide solution to the test solution, intense yellow color is formed which turns colourless on adding few drops of dil. HCl indicates presence of flavonoids.

c) **Zinc hydrochloride test-** To the test solution, add mixture of zinc dust and conc. HCl, it gives red colour after few minutes.

5. **Test for Glycosides**

a) **Borntrager's test:** Boil the test material with 1 ml of sulphuric acid in a test tube for five minutes. filter while hot. cool the the filtrate and shake with equal volume of dichloromethane or chloroform. Separate the lower layer of dichloromethane or chloroform and shake it with half of its volume of dilute ammonia. A rose pink to red colour is produced in the ammoiacal layer.

6. **Test for Tannins**

a) **Ferric chloride test-** Treat the test solution with ferric chloride solution, green colour appears if condensed tannins are present.

b) **Lead acetate test-** When lead acetate solution is added to the test solution, white precipitate is formed indicating the presence of tannins.

7. **Test for Steroids and Triterpenoides**

a) **Libermann-Burchard test-** Treat the extract with few drops of acetic anhydride, boil and cool. Then add concentrated sulphuric acid from the side of the test tube, brown ring is formed at the junction of two layers and upper layer turns green which shows present of steroids and formation of deep red colour indicates presence of triterpenoids.

b) **Salkowski test-** Treat the extract with few drops of concentrated sulphuric acid, red colour at lower layer indicates presence of steroids and formation of yellow coloured lower layer indicates presence of triterpenoids.

8. **Test for Saponins**

a) **Froth formation test-** Add 2ml of test solution in water in a test tube and shake well, stable froth (foam) is formed.

9. **Test for Amino acids**

a) **Ninhydrine test-** Add ninhydrine to the test solution, boil, voilet colour indicates the presence of amino acids.

10. **Test for Starch** -By adding weak iodine solution to the aqueous solvent, blue colour appears indicating the presence of starch which disappears on heating.

Table 2: Qualitative Phytochemical Analysis of *Sphaeranthus indicus* whole plant extracts.

Type of Extract ->		**Aqueous**	**Hydroalcoholic**	**Methenol**	**Ethenol**	**Chloroform**	**Ether**
Components	**Test**						
Carbohydrate	Molish Test	+	+	–	–	–	–
Proteins	Xanthoproteic Test	+	+	+	+	+	+
Alkaloids	Mayer's test	–	–	–	–	–	–
	Wagner's test	–	–	–	–	–	–
	Hager's test	–	–	–	–	–	–
Flavonoids	Shinoda test	–	+	–	–	+	–
	Alkaline reagent test	+	+	+	+	–	+
	Zinc hydrochloride test	–	–	–	–	–	–
Glycosides	Bontragger test	–	–	–	–	–	–
Tannins	Ferric chloride test	+	+	+	+	–	–
	Lead acetate test	+	+	+	+	–	–
Steroids	Libermann-Burchard test	+	+	–	–	–	–

	Salkowski test	+	+	_	_	_	_
Saponins	Froth formation test	+	+	_	_	+	_
Amino Acids	Ninhydrine test	_	_	_	_	_	_
Starch		_	_	_	_	_	_

RESULTS AND DISCUSSION

Sphaeranthus indicus Linn. Is popularly known weed available in fields. Aerial parts of the plants are used mainly in medicinal preparations. Macroscopic characters revealed the characteristic feature of stem pieces which were flattened with toothed wings and longitudinal wrinkles. Presence of hairs and aromatic odour are useful in identification of the plant macroscopically. Collateral vascular bundle and presence of glandular trichomes are specific findings of the stem microscopy. Where as distribution of anisocytic and anomocytic stomata on upper and lower surface of a leaf respectively are specific features in its identification.

Phytochemical test done to evaluate the presence of the concerned phytochemical utilising the specific chemical test. The physico-chemical and phytochemical parameters help in judging the purity and quality of drug. Physico-chemical analysis of the sample was done & compaired with the values given in the Ayurvedic Pharmacopoeia of India. Observations are given in Table 1&2.

CONCLUSION

Data obtained from the present study i.e the presence of Phytochemicals like Carbohydrates, Proteins, Flavonoids, Tannin, Steroids & values obtained from Physicochemical analysis were within standard limits which can be used as the reference parameters for the quality assurance of *Sphaeranthus indicus Linn.* Sample in further studies.

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