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PHYSICOCHEMICAL ANALYSIS OF KOKILAKSHA(ASTERCANTHA LONGIFOLIA NEES) WHOLE PLANT

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ABSTRACT

Kokilaksha (Astercantha longifolia Nees) is a small plant with small thorns or hairy parts all over the plant. The plant is found all over India which grows as a weed on the road side and found near water sources, fields and marshy land. *Kokilaksha* is mentioned in various ayurved classics having many therapeutic qualities and it is widely use in many formulations medical practices. An establishment of pharmacognostical standard on identification, purity, quality and classification of herbal plant is required. Ensuring the quality control of herbal raw materials and their bioactive components is crucial for establishing their suitability. These raw materials can be systematically identified through morphological, histological, chemical, physical, and biological analyses. The aim of the study is to evaluate the preliminary physicochemical characters of *Kokilaksha* (Astercantha longifolia Nees). Various pharmacognostic and preliminary phytochemical characters observed in this may help in standardization, identification and carrying out further research in *Kokilaksha* (Astercantha longifolia Nees).

KEYWORDS: *Kokilaksha*, Astercantha longifolia, Physicochemical analysis, Pharmacognostic standardization.

INTRODUCTION

Kokilaksha consists of dried whole plant of *Asteracantha longifolia* Nees. Syn. *Hygrophila spinosa* T.Anders (Fam. Acanthaceae); a spiny, stout, annual herb, common in water logged places throughout India.[1]

Vernacular names

Sanskrit : *Kokilaksh, Ikshura, Ikshuraka*

Hindi : *Talmakhana*

Gujrati : *Ekharo*

Marathi : *Talikhana, Kalsunda*

Tamil : *Nirmulli*

Telugu : *Nirugobbi*

Classical categorization

It is included in following gana and varga

Charaka Samhita – shukrashodhana

Kaidev Nighantu[2] *- Aushadhi varga*

Bhavprakash Nighantu[3]*- Guduchyadi varga*

Nighantu Adarsh[4] *- Pataladi varga*

Raj Nighantu[5]*- Shatavhadi varga*

Madanpal Nighantu[6] *- Abhayadi varga*

Shodhal Nighantu[7] *- Lakshamanadi varga*

Asteracantha longifolia [Syn-Hygrophila auriculata (Schum.) Heine; Hygrophila spinosa T. Anders. (L.) Nees, belongs to family Acanthaceae, is a source of the Ayurvedic drug, 'Kokilaksha'. It is mentioned in Ayurvedic treatise like 'Sushruta Samhita' and 'Charak Samhita' as Rasayan or rejuvenator. A. longifolia is described in Ayurvedic literature as Ikshura, Ikshugandha and Kokilasha "having eyes like the Kokila or Indian Cuckoo". Bhavaprakash describes Ikshuraka as having sheetal, madhura and snigdha properties. Acharya Charak included Ikshuraka among other herbs in the treatment of Ashmari. Additionally, Ikshuraka is a component of Ayurvedic formulations such as "Sriravallabh Modak" and "Rativardhanyog," which are mentioned in ancient texts for enhancing sexual behavior and serving as general tonics.[8] it is used in diseases like Vatarakta, Amavata, Ashmari, Trushna, Shotha, Anidra.[9] Vedic text quoted it as vata- pittahara, balya and shukrashodhaka.

Botanical Description

a) Macroscopic

Root - Mostly adventitious, whitish to brown; no characteristic odour and taste.

Stem- Usually unbranched, fasciculate, subquadrangular, swollen at nodes, covered with long hairs which are numerous at the nodes, externally grayish-brown, creamish brown in cut surfaces; no characteristic odour and taste.

Leaf- Greenish-brown, 1-7 cm long, 0.5-1 cm wide, sub sessile, lanceolate, acute, entire and hairy.

Flower– Purple blue, usually occurring in apparent whorls of eight (in 4 pairs) at each node; bracts about 2.5 cm long, with long white hairs; calyx 4- partite, upper sepal 1.6-2 cm long, broader than the other three, which are 1.3 cm long, all linear- lanceolate, coarsely hairy on the back and with hyaline ciliate margins; corolla 3.2 cm long, widely 2 lipped, tube 1.6 cm long, abruptly swollen at top; stamens 4, didynamous, second pair larger; filament quite glabrous; anthers two celled, sub equal,glabrous; ovary two celled with 4 ovules in each cell; style filiform, pubescent; stigma simple, involutes with a fissure on upper side.

Fruit- Two celled, linear-oblong, compressed, capsule about 0.8 cm long, pointed, 4- seeded.

Seed - Ovate, flat or compressed, truncate at the base, 0.2-0.25 cm long and 0.1 - 0.15 cm wide, hairy but appearing smooth; when soaked in water immediately get coated with mucilage, light brown; taste slightly bitter and odour not distinct.

Chemical constituents[10]

Apigenin-7-0-glucuronide and 7-0glucoside (flowers), histidine, lysine, phenylalanine, linoleic, oleic, palmitic and stearic acids, xylose, uronic acid, polysaccharides, xylan, lipase, protease, saponin, sterols, asterol I, II, III, IV, astercanthine, asteracanthicine (seeds), lupeol, betulin, phytosterol, essential oil (root), lupeol, ascorbic acid, nicotinic acid (leaves) etc.

Taxonomic position[11]

Kingdom	Plantae
Subkingdom	Viridiplantae
Division	Tracheophyta
Subdivision	Spermatophyta
Class	Magnoliopsida
Order	Lamiales
Family	Acanthaceae
Genus	Hygrophila R. Br.
Species	Auriculata

b) Microscopic

Root

Root shows a single layered epidermis of thin walled, rectangular to cubical, parenchymatous cells having unicellular hairs; secondary cortex composed of round to oval or oblong, thin-walled cells having large intercellular spaces; most of these cells divided longitudinally and transversely with walls forming 4-6 or more chambers; size of these cells and intercellular spaces gradually reduce towards the inner region, where these cells are mostly radially elongated, arranged in radial rows, a few thick-walled cells found scattered singly throughout secondary cortex.

secondary phloem narrow consisting of small, thin-walled, polygonal cells; phloem fibres thick-walled, occur in groups of 2-6 or singles, scattered throughout the phloem region; secondary xylem forms continuous ring; vessels angular, broader towards centre, arranged radially having spiral thickenings, surrounded by thick-walled parenchyma and xylem fibres; fibre walls uniformly thickened; multi and uniseriate medullary rays occur from primary xylem region upto secondary cortex; ray cells thin walled, radially elongated in xylem region, circular to transversely elongated in phloem region.

Stem

Stem shows somewhat sub-quadrangular outline; cork consists of 5-10 rows of rectangular, radially arranged, moderately thick-walled, brownish cells; collenchyma 4-8 layered consisting of isodiametric cells; a few thick-walled, isolated cells found scattered in this zone; cortical cells thin-walled, round, oblong, variable in size, with a number of large air cavities; a special feature of these cells is the formation of tangential and radial walls within the cell dividing it into 4-5 or more parts; most of cells contain numerous acicular crystals of calcium oxalate; endodermis single layered, composed of transversely elongate, thin walled cells; phloem narrow, consisting of round to polygonal cells, peripheral ones larger, inner cells smaller; fibres thick- walled, single or in groups of 2-3, some cells contain calcium oxalate crystals similar to those found in cortical cells; xylem present in a ring; vessels with spiral thickenings, arranged radially; fibres elongated with wide lumen and pointed tips, medullary rays uni to multi seriate extend upto secondary cortex; ray cells thin-walled, radially elongated in secondary xylem, transversely elongated in secondary phloem; pith large, composed of polygonal, thin-walled parenchymatous cells, having small intercellular spaces; a few cells contain calcium oxalate crystals similar to those found in secondary cortex.

Leaf

Midrib- Shows concavo-convex outline; epidermis on either surface covered with thick cuticle; collenchyma 2-5 layered; stele composed of small strands of xylem and phloem having some groups of fibre; rest of tissues composed of thin-walled, parenchymatous cells, a few of them containing acicular crystals of calcium oxalate; cystolith present beneath upper and above the lower epidermal cells.

Lamina- Shows epidermis single layered on either surface, composed of thin walled, parenchymatous, tangentially elongated cells, covered with thick cuticle; stomata diacytic, 1-5 celled hairs present on both surfaces; palisade 1-2 layered; spongy parenchyma composed of 3-5 layered, loosely arranged cells traversed by a number of veins; palisade ratio 6.25-15.75; stomatal index 17.24-30.78; vein islet number 17- 42.

Fruit– Shows single layered epidermis covered with striated cuticle followed by 5-10 layered, thick-walled and oval to hexagonal, lignified, sclerenchymatous cells.

Seed– Shows hairy testa composed of thin-walled, tangentially elongated cells covered with pigmented cuticle; embryo composed of oval to polygonal, thin-walled, parenchymatous cells containing oil globules.

Powder study- Light brown; shows aseptate, elongated fibres; vessels with simple pits and spiral thickening; palisade, acicular crystals of calcium oxalate, unicellular hairs and globules.

MATERIALS AND METHODS

Collection of plant material- sample of *Astercantha longifolia* were collected from my farm at Madheli, Dist- Chandrapur of Maharashtra. Plant material that is whole plant is dried in shed and made into a coarse powder.

Physicochemical study[12]

The physicochemical standards help in assessment of crude drug. These are rarely constant, but helps in evaluation of drug. Quality of the drug can be assessed with this analysis and thus biochemical variations, adulterations, substitutions, effect of storage/treatment occurring in it can be tested. The moisture content / loss on drying, ash value, acid insoluble ash, water soluble ash, acid insoluble ash, water soluble extractive, alcohol soluble extractive and pH of the powdered sample were determined by the method as described in WHO guidelines.[13] Results are tabulated in table no. 1.

Table No. 1: Evaluation of the dried powder of *Astercantha longifolia* whole plant.

Evaluation parameter	Whole plant value (%w/w)
Loss on drying	10.15
Total Ash value	8.57
Acid insoluble ash	0.91
Alcohol soluble extractive	3.26
Water soluble extractive	18.45
pH	5.3

RESULT AND DISCUSSION

Drug microscopy revealed several characteristics: an aerenchymatous cortex in the central region of the root; a semi-quadrangular shape with four vascular bundles positioned at each corner in the early stages of stem development, with developing fascicular vascular bundles emerging between them; in mature stems, there are six vascular bundles - four at the corners and two opposite each other in between; a broad cortical aerenchyma is evident in mature stems; the leaves exhibit amphistomatous properties with anomocytic stomata; and a crescent-shaped meristele is observed in the leaf structure. The values obtained after experimental study of *Astercantha longifolia* are very much similar to the values mentioned in Ayurvedic Pharmacopoeia of India (API). *Kokilaksha* has been traditionally used in Ayurvedic medicines and its potential as a source of novel drugs or lead compounds is promising due to its rich phytochemistry. Further research is needed to explore its potential in various diseases.

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