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### Pharmacognostic Studies Of Kantakari Root (Solanum Xanthocarpum Schard & Wend.): An Experimental Study

Dr. Girigaon Yogesh Husanappa<sup>1</sup>, Dr. Banne Satej Tippanna<sup>2</sup>

<sup>1</sup>Department of Dravyaguna, KLEU, Shri BMK Ayurveda Mahavidyalaya, Belgaum, Karnataka, M.D.

(Ayu), Email: [yogesh10660@gmail.com](mailto:yogesh10660@gmail.com)

<sup>2</sup> **Institutional address:** KLE UNIVERSITY (Accredited 'A' Grade by NAAC)  
Shri B.M.Kankanwadi Ayurveda Mahavidyalaya, Shahapur, Belgaum- 590003. (Karnataka)  
Fax: 0831 2424157

**Working and Postal address:** Dr. Satej Tippanna Banne.  
Shri B.M.Kankanwadi Ayurveda Mahavidyalaya,  
Shahapur, Belgaum- 590003. (Karnataka)

**Corresponding author:** Dr. Girigaon Yogesh Husanappa, Mob:+919845710660,  
Email: [yogesh10660@gmail.com](mailto:yogesh10660@gmail.com)

#### ABSTRACT:

*Present study deals with Pharmacognostic Study of Root of Kantakari (Solanum xanthocarpum Serb. & Wende. Root Macroscopy: Size, Shape, Surface, Fracture, Organoleptic characters like Appearance, Color, Taste, Odour. Root microscopy Root powder macroscopy and microscopy. Physicochemical analysis Ashvalue, Acid insoluble Ash, pH, Specific gravity. Different Solvent Extraction, Alcohol (ethanol) and Aqueous Extraction of Root of Kantakari (Solanum xanthocarpum Serb. & Wende). Preliminary phytochemical screening of Aqueous and Alcoholic Extract for Carbohydrates, proteins, saponins, tannins, steroids, chlorides, irons etc. TLC Analysis of Alcohol (ethanol) and Aqueous Extraction of Root of Kantakari (Solanum xanthocarpum Serb. & Wende). Most of the phytochemical constituents are soluble in water; thus preferred formulation of Kantakari should be of water base—like kwatha etc. TLC possess some common Rf values found in Ethanol, extract samples which represents similar compounds in both the extracts.*

**KEY WORDS:** Kantakari, Pharmacognostic, Root.

#### INTRODUCTION:

*Solanum xanthocarpum* Schard & Wend. is a

#### MORPHOLOGY:

very prickly, low diffuse suffrutescent, perennial

#### Habit and General Features:

herb or under-shrub, with practically little stem,

but having numerous irregularly ramous or

trailing woody divaricate slightly triangular, flexuous branches that spread close to the ground, often rooting at the nodes and covering the circular area 02-04 feet in diameter. The whole plant is thick armed with strong broad based sharp compressed straight whitish or yellowish white prickles nearly half an inch long. The shoot when young are covered with stellate down but become barely glabrous when mature. They bear ovate or ovate-oblong sinuately lobed or pinnatifid sparsely pubescent to glabrescent prickly membranous leaves which are dark green above and considerably lighter or paler below.

#### **DISTRIBUTION AND HABITAT:**

The plant is found in all dry districts in the plain as well as low hills throughout India from Punjab and Assam to Cape Comorian. In South India it is found abundantly along the Coromandel Coast and in district of Tinnevely and Kanyakumari. Every type of soil and situation which is not too moist seems to suit it, and it is commonly found growing as a weed of roadside and wastelands, on rubbish heaps and similar situation near villages. The

plant is in flower and fruit throughout the year.<sup>1</sup>

#### **a) MACROSCOPIC**

##### **a) ROOTS:**

The roots are long, fairly thick, hard and of light brown Color. The surface is not quite smooth being beset with many minute rootlets and a few lenticles. The thickness of the outer bark of the root is about 1/3<sup>rd</sup> the thickness of the central wood origin. The surface skin is quite thin & on scrapping a silvery white tissue is exposed. The wood is cream yellow & minutely porous. The entire root is bitter in taste.



**Fig.1: Roots of *Solanum xanthocarpum* Schard & Wend.**

##### **b) STEM:**

Herbaceous, prickly with prominent nodes and internodes, green when fresh, young branches,

covered with numerous hairs, mature ones glabrous, furrows more prominent in young stem appearing almost circular towards basal region, stem pieces 8-10 mm thick of variable length, external surface light green, when dry, surface yellowish green and smooth, transversely smoothed surface shows a very thin bark and prominent wood, centre shows a large and distinct, pith, mature and dry stem often with hollow pith, fracture short to slightly fibrous.

**c) LEAVES:**

Petiolate, exstipulate, ovate--oblong or elliptic, sinuate or sub-pinnatifid, sub acute hairy, 4-12.5 cm long and 2-7.5 cm wide, green, veins and midrib full with sharp prickles, odour and taste not distinct.



**Fig.2: Leaves of *Solanum xanthocarpum* Schard & Wend.**

**d) FLOWERS:**

Ebracteate, pedicellate, bisexual, pentamerous, regular, complete, bright blue or bluish purple.

**Calyx**-persistent, gamosepalous, tube short, globose, linear-lanceolate, acute, hairy, 0.5-1.3 cm long and densely prickly.

**Corolla**-gamopetalous, lobes deltoid, acute, hairy, 1-2 cm long and purple in Color. **Stamens**- 5, epipetalous, basifixed.

**Filaments**- short 1-1.5 mm long, anther,

**Anthers**- oblong lanceolate, 0.7-0.8 cm long.

**Ovary**- superior, ovoid, glabrous, bilocular with axile placentation having numerous ovules.



**Fig.3: Flowers of *Solanum xanthocarpum* Schard & Wend.**

**e) FRUIT:**

Berry globular, measuring 0.8-1 cm in diameter, surrounded by persistent calyx at base unripe fruits variegated with green and white strips, ripe fruit shows different yellow and white shades.

**f) SEED:** Circular, flat, numerous, embedded in a fleshy mesocarp about 0.2 cm in diameter, glabrous taste, bitter and acrid.<sup>2</sup>



**Fig.4: Fruits of *Solanum xanthocarpum* Schard & Wend.**

**CHEMICAL CONSTITUENTS:**

Kantakari contains following chemical constituents:

Carpesterol, gluco-alkaloid solanocarpine; solanine-S; solasodine,

solasonine, solamargine, solamargine, cycloartanol, cycloartenol, stigmasterol, campesterol, cholesterol, sitosteryl-glucoside, stigmasteryl-glucoside, solasurine, galactoside of sitosterol, methyl ester of 3,4-dihydroxycinnamicacid and 3,4-dihydroxycinnamicacid (caffeic acid), isochlorogenic, neochlorogenic, chlorogenic acids (fruits); flavonal glycoside, quercetin-3-O-D-glucopyranosyl-0-D-mannopyraniside, apigenin, sitosterol (flower); solanocarpine and amino acid (seeds); coumarins, scopolin, scopoletin, esculin and esculetin (leaves, roots and fruits); Carpesterol [(22-R)-22-hydroxy-6-oxo-4-methyl-5-stigmast-7-en-3-ylbenzoate)].

**SUBSTITUTES AND ADULTERANTS:**

*Solanum xanthocarpum* Serb. & Wende is of two types, viz., blue or purple flowered and white flowered. White flowered is used in the place of Laxmana

by Vaidyas as, the botanical identity is not yet established. Some people use *Solanum torvum* Sw. as Kantakari.

**PROPOGATION AND CULTIVATION:**

*Solanum xanthocarpum* Serb. & Wende tolerates variety of soil and climatic conditions. It can be propagated by seeds or vegetatively by stem cuttings. Treatment with IBA at a concentration of 100 mg/ l was found most effective in increasing the percent rooting, root growth, number of roots and leaves produced per cutting and the shoot length.

An aqueous solution of gibberellic acid 1000ppm and the following amino acids 0.5 ppm each: 1) Glutamic acid 2) Histidine 3) Leucine 4) Lysine 5) Methionine 6) Nicotinic acid 7) Proline 8) Thiamine HCL 9) Tryptophane 10) Valine were found useful in the germination of *Solanum xanthocarpum* Serb. & Wende seeds. During trials conducted for in vitro propagation, direct

shoot bud formation occurred in the leaf, root and multilayered strip in response to kinetin or BAP. Stem explants proliferated to produce a callus which differentiated a few shoot buds. Shoot buds could be rooted and full plants were raised.<sup>3</sup>

**PHARMACOGNOSTIC STUDY OF KANTAKARI ROOT:**

**Macroscopy:**

**Morphology of drug:**

Habit: Very prickly, perennial herb or under-shrub. The whole plant is thick armed with strong broad based sharp compressed straight whitish or yellowish white prickles nearly half an inch long. The shoot when young are covered with stellate down but become barely glabrous when mature. They bear ovate or ovate-oblong sinuately lobed or pinnatifid sparsely pubescent prickly membranous leaves which are dark green above and considerably lighter or paler below.

Root:

Macroscopic characters of Root:

Shape – almost cylindrical

Surface- bearing number of longitudinal wrinkles with occasional scars and small rootlets

Dimensions - 10-35 cm in length

Few mm to 2 cm diameter

Organoleptic characters:

Color –light brown surface

Shape – Almost cylindrical

Odour – Characteristic

Taste – Bitter

Fracture –Short

**Table No. 1: Root microscopy of Kantakari root**

Characters	Kantakari Root
<b>Cork</b>	Epidermis consisting of 2-3 rows of thin, rectangular cells
<b>Cortex</b>	Thin-walled, comparatively large rounded to tangentially elongated cells
<b>Microcrystal</b>	The cortical cells contains of characteristic crystal like content
<b>Medullary ray</b>	Many, long, start at wood and reach up to the cortex, contains of starch.
<b>Vessels</b>	Fairly uniformly distributed throughout the wood
<b>Vascular bundle</b>	Xylem rectangular or slightly elongated with simple pits

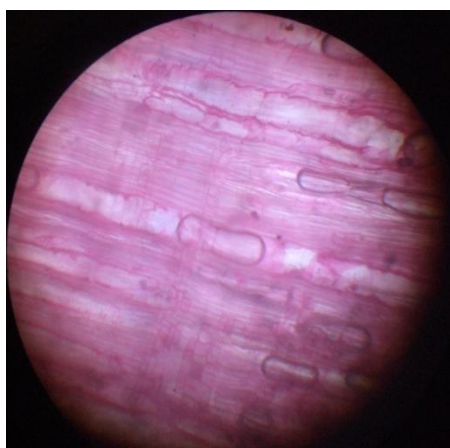


Fig.5: L.S. of Kantakari root

Fig.6:L.S. of Kantakari root Showing Pitted Vessel

Table No.2: Powder macroscopy of Kantakari root

	Kantakari Root
Touch	Soft
Color	Pale yellow
Taste	Bitter
Odour	Mild characteristic

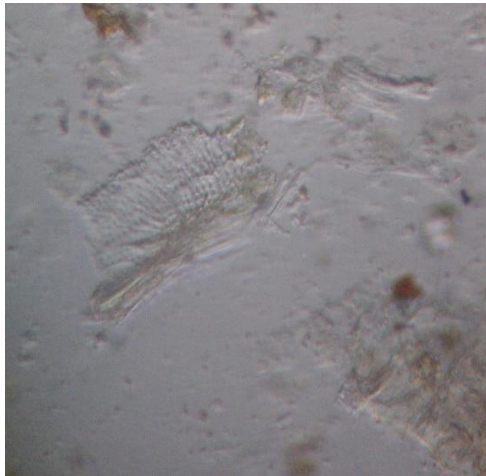


Fig.7: L.S. AND POWDER MICROSCOPY OF KANTAKARI ROOT

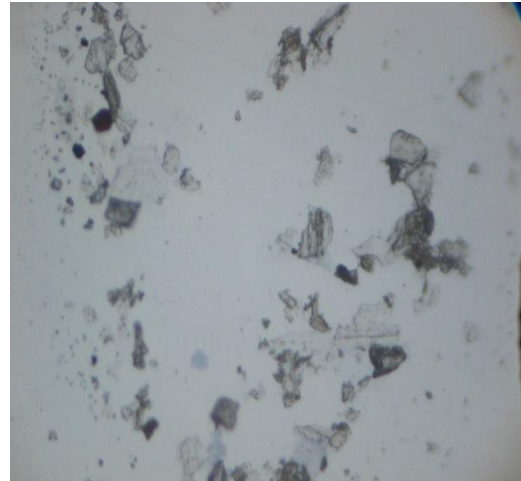
Table No.3: Powder microscopy of Kantakari root

	Kantakari Root
Stone cells	Present
Vessel	Pitted vessels present
Calcium oxalate	Present
Stones	Present

Starch	Traces
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**Fig.8: Powder microscopy using Phloroglucinol and conc.Hcl**



**Fig.9: By using chloral hydrate solution**

**Table No.4: Physico chemical analysis of Kantakari root**

	API Standards	Kantakari Root
<b>Loss on Drying</b>	-	6.34%
<b>Total Ash value</b>	Not more than 9%	4.40%
<b>Acid insoluble ash</b>	Not more than 3%	0.599%
<b>Water soluble ash</b>		3.5%
<b>pH</b>	-	4.49
<b>Specific gravity</b>	-	1.009

**Table No.5: Different solvent extractive values of Kantakari root**

Sl.No.	Solvents	Test drug Extractive values
01	Ethanol	7.118%



02	Methanol	7.028%
03	Pet. Ether	3.99%
04	Chloroform	2.3%
05	Benzene	0.95%

**Table No.6: Extractive values of Kantakari root**

Sl.No.	Solvents	Test drug Extractive values	API Standards
01	Water	18.94%	Not less than 16%
02	Ethanol	7.118%	Not less than 5%
03	Methanol	7.028%	Not less than 5%

**Table No.7: Test for inorganic components of Kantakari root**

Sl.No.	Test	Test drug
01	Test for Iron: a) Test soln. + Ammonium thiocyanate	+
02	Test for Cupper: a) Test soln. + Potassium ferocynaide	+
03	Test for Chlorides: a) Test soln. + AgNO <sub>3</sub>	+

**Table No.8: Priliminary phytochemical screening of Kantakari root**

Sl. NO	Test	Test drug (Aqueous Extract)	Test drug (Alcoholic Extract)
01	Test for Carbohydrates: a) Benedict's Test b) Molish Test	+ve +ve	+ve +ve

02	Test for pentose sugars a) Solun. + HCl+ Crystals of Phloroglucenol	-ve	-ve
03	Test for non-reducing Sugars a) 3ml soln. + few drops of Iodine (Blue Color appears)	+ve	+ve
04	Test for Tannins: a) FeCl <sub>3</sub> (5%) b) Potassium c) Dichromate d) Lead acetate e) Dil.HNO <sub>3</sub>	+ve +ve +ve +ve +ve	+ve +ve +ve +ve +ve
05	Test for Alkaloids: a)Wagner's Reagent	+ve	+ve
06	Test for Steroids: a) Salkowski reagent	+ve	-ve
07	Test for Proteins: a) Xanthoprotein test b) ppt test.	+ve +ve	+ve +ve
08	Test for starch: Tannic acid test	+ve	+ve
09	Test for Flavanoids: Solun. + 5ml ethanol + 0.5 gm Mg (Pink Color seen)	+ve	+ve

**Table No.9: TLC profile of Kantakari root**

SI No	SAMPLE	Rf VALUES
01	Aqueous Extract	0.10, 0.12, 0.15, 0.18, 0.72
02	Alcoholic Extract	0.19, 0.21, 0.25

**RESULT AND CONCLUSION:**

Kantakari is explained in most of the Samhithas as well as Nighantus

and indicated in many diseases. In Charaka Samhita, Kantakari is classified under Kanthya

mahakashaya, Hikkanigrahana  
mahakashaya, Kasahara  
mahakashaya, Shothahara  
mahakashaya,  
Angamardaprashamana  
mahakashaya and  
Sheetaprashamana mahakashaya.  
This tells the wide range of  
diseases where it can be used  
according to swa-yukti. Most of the  
phytochemical constituents are  
soluble in water; thus preferred  
formulation of Kantakari should be  
of water base—like kwatha etc.  
TLC possess some common Rf  
values found in Ethanol, extract  
samples which represents similar  
compounds in both the extracts.

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