

## **THERAPEUTIC POTENTIALS OF KANTAKARI (*Solanum xanthocarpum* Schrad. & Wendl.)**

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### **Abstract**

The medicinal plants are widely used by the traditional medical practitioners for curing various diseases. Kantakari (*Solanum xanthocarpum* Schrad. & Wendl.) of the family Solanaceae is one of the dasamoola and commonly used drug in Ayurveda. In traditional systems of medicine, different parts like leaves, stem, flower, root, seeds of *Solanum xanthocarpum* and the plant as a whole are used. The drug is used as anti-asthmatic, hypoglycaemic, anti-inflammatory, antitumor, anti-tussive, antipyretic, antispasmodic, anti-histaminic, hypotensive and cytotoxic activity. Focus on plant research has increased all over the world and a large body of evidence has been collected to show immense potential of the drug kantakari used for various respiratory disorders in the Ayurvedic systems of medicine. To facilitate the readers to look at, more easily, the datas in the present review have been organized in various sections according to Ayurvedic view and with recent researches carried out on the drug.

**Key Words:** Ayurveda; Kantakari; *Solanum xanthocarpum*.

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### **INTRODUCTION**

Kantakari (*Solanum xanthocarpum* Schrad. & Wendl.) of the family Solanaceae is one of the dasamoola and commonly used drug in Ayurveda. Dasamoola literally means combination of ten plant roots together. It comprises roots of five big or major trees (Brihat panchamoola) and roots of five small or minor herbs (Laghu panchamoola). Kantakari comes under Laghu panchamoola.

Dasamoola is an important compound formulation of Ayurveda and has been advocated with promising results in various diseases.<sup>[1]</sup> Kantakari is widely used to treat respiratory diseases in Ayurveda.<sup>[2]</sup> Ayurvedic classics categorized this plant under Kasahara, Sotha hara, Hikka nigrahana, Kantya, Anga marda prasamana, Sheetaprasamana dasemaanis (Group of ten drugs).<sup>[3]</sup> It is used especially in treating kasa (cough), shwasa (bronchial asthma), jwara (fever) etc.

Kantakari is used as an ingredient in many of the compound formulations like Vyaghriharitaki avaleha,<sup>[4]</sup> Chavanaprasha, Dasamoolarishta,<sup>[5]</sup> Vyaghri tailam,<sup>[6]</sup> Vyaghri ghrtam,<sup>[7]</sup> Vyaghriyadi kwatha<sup>[8]</sup> etc. *S. xanthocarpum* is non toxic and has been reported to be safe for human use<sup>[9]</sup> was already in use and is clinically safe to consume. The whole plant is useful in vitiated conditions of vata and kapha, helminthiasis, dental caries, inflammations, flatulence, constipation, dyspepsia, anorexia, leprosy, skin diseases, hypertension, fever, cough, asthma, bronchitis, hiccough, lumbago, haemorrhoids and epilepsy. The plant is bitter, acrid, thermogenic, anthelmintic, anti-inflammatory, digestive, carminative, appetizer, stomachic, febrifuge, expectorant, laxative, stimulant, diuretic, rejuvenating, emmenagogue and aphrodisiac.<sup>[10]</sup>

The data in the present review have been organized in various sections according to Ayurvedic view and with few proved activities of the drug.

## MATERIAL AND METHODS

The datas were collected from Ayurvedic literatures and scientific journals etc.

## Sanskrit Synonyms:

Kantakari, Duhsparsa, Vyaghri, Kshudra, Nidigdika, Kantakarika, Dhavani, Kantalika.<sup>[11]</sup>

## Regional Names:

Assam	:	Katvaedana, Kantakar
Bengali	:	Kantakari
English	:	Febrifuge Plant
Gujarati	:	Bhoringani
Hindi	:	Katai, Katali, Ringani, Bhatakataiya, Chhotikateri
Kannad	:	Nelagulla, Kiragulla
Malayam	:	Kantakari Chunda
Marathi	:	Bhauringani, Kataringani
Orissa	:	Bhejiaugana, Ankarati, Chakada Bhaji
Punjabi	:	Kandiari
Tamil	:	Kandangatri, Kandan Katri, Kandangathiri
Telugu	:	Nelamulaka, Pinnamulaka, Mulaka, Chinnamulaka, Vakudu <sup>[11]</sup>

## Properties:

Screening the various classics like Bhavaprakasha nighantu, Rasa (taste) of kantakari is katu (pungent) and tikta (bitter). Other properties are mentioned in the Table 1.

**Table 1: The properties of kantakari**

Text	Rasa		Guna		Virya	Vipaka
	Katu	Tikta	Laghu	Ruksha	Ushna	Katu
B.P <sup>[12]</sup>	+	+	+	+	+	+
D.N <sup>[13]</sup>	+	+	-	-	+	-
R.N <sup>[14]</sup>	+	+	-	-	+	-
K.N <sup>[15]</sup>	+	+	+	+	+	+
N.A <sup>[16]</sup>	+	+	-	-	+	+
P.V.S <sup>[17]</sup>	+	+	+	+	+	+

“+” Mentioned; “-” Not mentioned

B.P – Bhavaprakasha nighantu; D.N – Dhanwantari Nighantu; R.N – Raja Nighantu; K.N – Kaiyadeva nighantu; N.A – Nighantu Adarsha; P.V.S – Dravyaguna vijnana by PV Sharma.

## Geographical Source:

places as a weed on roadsides and waste lands.<sup>[19]</sup>

It is found throughout India, ascending to 2,200 m on the Himalaya,<sup>[18]</sup> mostly in dry

### Description of the drug:

Diffuse herb with prickly stem, leaves and calyx. Root is almost cylindrical and tapering. Fracture-short; Taste-bitter with no characteristic odour. Leaves ovate oblong, acute, pinnately 7-11 lobed, sparsely stellate and pubescent. Nodes and internodes are prominent in Stem. Fracture short to slightly fibrous. Flowers purple in colour, few in axillary cymes.<sup>[20]</sup> The unripe fruits are green in colour with white lines, glabrous, globular berries, and become yellow when matured.<sup>[21]</sup> Seeds are smooth, compressed, reniform; taste- bitter.

### Chemical Constituents:

The reported chemical constituents are carpesterol, gluco alkaloid solanocarpine, solanine-S, solasodine, solasonine, solamargine,  $\beta$ -solanomarginine, cycloartanol, stigmasterol, campesterol, cholesterol, sitosterol-glucoside, stigmasteryl glucoside, solasurine, galactoside of  $\beta$ -sitosterol, methyl ester of 3,4-dihydroxycinnamic acid and 3,4-dihydroxycinnamic acid (caffeic acid), isochlorogenic, neochlorogenic, chlorogenic acids (fruit); flavonal glycoside, quercetin-3-O- $\beta$ -D-glucopyranosyl-0- $\beta$ -D-mannopyranoside, apigenin, sitosterol (flower); solanocarpine and amino acids (seeds); coumarins, scopolin, scopoletin, esculetin and esculetin (leaves, roots and fruits); carpesterol, tomatidenol, norcarpesterol and solasonine (plant).<sup>[11]</sup>

**Part(s) Used:** Whole Plant<sup>[18]</sup>

**Dose:** 50 ml as decoction<sup>[22]</sup>

### Karma:

Vedanasthapana (pain reliever), Shothahara (reduces swelling), Swedajanana (increases sweating), Jwaraghna (Anti-pyretic), Deepana

(appetizer), Pachana (digestive), Rechana (purgative), Bhedana, Krimighna (anthelmintic), Amadoshanashaka, Raktashodhaka (blood purifier), Kasahara (relieves cough), Shwasahara, Kanthya, Hikkanigrahana, Mootrala, Garbhashayasankochaka, Vajikarana (aphrodisiac) etc are the therapeutic activities of kantakari.<sup>[11]</sup>

### Therapeutic Uses:

The plant is useful in fever, cough, asthma etc.<sup>[23]</sup> The stem, flowers and fruits are prescribed for treating burning sensation in the feet accompanied by vesicular eruptions. The hot aqueous extract of dried fruits is used for treating cough, fever and heart diseases.<sup>[24]</sup> The fruit is known for several medicinal uses like anthelmintic, antipyretic, anti-inflammatory, antitumor, cytotoxic activities, antiasthmatic, antispasmodic and hypotensive. Juice of fruit of *Solanum xanthocarpum* is used in sore throats and rheumatism. The fruit paste is applied externally to the affected area for treating pimples and swellings.<sup>[25]</sup> It is also used in the preparation of contraceptive drug.

Plant powder is anti-tussive and its effect on patients with bronchial asthma and nonspecific cough has been explained as due to depletion of histamine from lung and its expectorant action as due to inorganic nitrogen content.<sup>[26]</sup> Root is an expectorant. It is prescribed in cough, asthma, pain in chest, used in the form of electuary.<sup>[27]</sup>

It has cardio stimulant, blood purifying and anti-inflammatory properties. It is useful in asthma, chronic bronchitis, cough, and pneumonia. Powdered plant is administered to children to cure chronic bronchitis (CSIR Database). Kantakari is mainly known for its shwasahara, kasahara, jwarahara property in different dosage form. (Table 2 – Table 6)

**Table 2: Few kwatha (decoction) formulations of kantakari**

Sl. No.	Name of the formulation	Indications	Reference
1.	Nagaradi kwatha	Jwara	B.R 4/70.p.75
2.	Kshudradi kwatha	Jwara	B.R 4/73.p.75
3.	Bilwadi panchamoola kwatha	Vataja jwara	B.R 4/74.p.75
4.	Kiratadi kwatha	Vataja jwara	B.R 4/75.p.75
5.	Vishwadi kwatha	Vataja jwara	B.R 4/83.p.76
6.	Bhunimbadi kwatha	Vataja jwara	B.R 4/85.p.77
7.	Dasamooladi kwatha	Jwara	B.R 4/93-95.p.77
8.	Marichadi kwatha	Kaphaja jwara	B.R 4/137-138.p.82
9.	Triphaladi kwatha	Kaphaja jwara	B.R 4/139.p.83
10.	Vyaghriyadi kwatha	Kaphaja jwara	B.R 4/149.p.84
11.	Navanga kwatha	Vatapitta jwara	B.R 4/157.p.84-85
12.	Nidhigdhakadi kwatha	Vatapitta jwara	B.R 4/164.p.85
13.	Nidhigdhakadi kwatha	Jwara, Kasa, Swasa	B.R 4/169.p.86
14.	Kantakaryadi kwatha	Daha, Trsna, Kasa	B.R 4/171-172.p.86
15.	Panchatikta kwatha	8 types of Jwara	B.R 4/176.p.87
16.	Kshudradi kwatha	Swasa, Kasa, Jwara	B.R 4/195.p.89
17.	Mustakadi kwatha	Vatakapha jwara	B.R 4/201.p.90
18.	Dasmooli kwatha	Swasa, Kasa, Parsvasula	B.R 4/202.p.90
19.	Dasamoola kwatha	Swasa, Kasa, Sannipatajwara	B.R 4/238-240.p.94
20.	Dwadasanga kwatha	Jwara with Swasa, Kasa	B.R 4/241.p.94
21.	Chaturdasana kwatha	Purana jwara	B.R 4/242.p.94
22.	Ashtadasanga kwatha	Sannipata jwara, Kasa, Swasa, Hrtgraha	B.R 4/243-244.p.94-95
23.	Bhunimbadya ashtadasanga kwatha	Tantra, Pralapa, kasa, Swasa	B.R 4/245.p.95
24.	Satyadi varga	Sannipata jwara, kasa, Swasa	B.R 4/251-252.p.95
25.	Brhat katphaladi kwatha	Sannipata jwara, Galaganda, Gandamala, kasa	B.R 4/253-256.p.95-96
26.	Brihatyadi kwatha	Kasa, swasa yukta sannipata jwara	B.R 4/266-267.p.97
27.	Laghupanchamoola kwatha	Vatapittolbana jwara	B.R 4/267.p.97
28.	Yogaraja kwatha	Sannipata jwara	B.R 4/272-274.p.97
29.	Baswanmooladi kwatha	Sitanga jwara, kasa, swasa, moha	B.R 4/277.p.98
30.	Tagaradi kwatha	Pralapaka sannipata jwara	B.R 4/281.p.98
31.	Karavyadi kwatha	Abinyasajwara	B.R 4/289-290.p.100
32.	Matulungadi kwatha	Abinyasajwara, anaha, sula	B.R 4/291.p.100
33.	Ksudradi vishvadi kwatha	Jihwakasannipata jwara	B.R 4/298.p.100
34.	Bharngyadi kwatha	Karnika sannipata jwara	B.R 4/322.p.104
35.	Kirathakadi kwatha	Kantakubja sannipata jwara	B.R 4/324.p.104
36.	Musthadi kwatha	Vishama jwara	B.R 4/348.p.107
37.	Swalpa bharangyadi kwatha	Vishama jwara	B.R 4/350.p.107
38.	Madhya bharangyadi kwatha	Vishama jwara, sannipathaja jwara, sheethantha jwara	B.R 4/351.p.107
39.	Brihat bharangyadi kwatha	Jwara	B.R 4/351.p.107
40.	Dashyadi kwatha	Jirna jwara	B.R 4/355-356.p.107
41.	Darvikwatha	VishamaJwara, Kasa, Swasa	B.R 4/357-364.p.108
42.	Nidhigdhakadi kwatha	Jirna jwara, Kasa, Swasa, Sula	B.R 4/438-439.p.116
43.	Guduchyadi kwatha	Rathri jwara	B.R 4/440-441.p.116
44.	Drakshyadi ashtadasanga kwatha	Jirnajwara, Kasa, Swasa	B.R 4/442-443.p.116
45.	Nidhigdhikadi kwatha	Pleehajwara	B.R 4/444.p.116
46.	Vyaghradi kwatha	Jwara,kasa,shwasa, peenasa	AH. Chi 1/61.p.555
47.	Nagaradi kashaya	Jwara,kasa,shwasa	AH. Chi 1/66.p.556

B.R. – Bhaishajya Ratnavali,<sup>[28]</sup> A.H. – Ashtanga Hridayam<sup>[29]</sup>

**Table 3: Few churana (powder) formulations of kantakari**

Sl. No.	Name of the formulation	Indications	Reference
1.	Sudharshana choorna	Vishamajwara	B.R 4/445-454.p.117
2.	Jwarabhairava choorna	Vishamawara	B.R 4/455-466.p.118
3.	Jwaranagamayura choorna	Sandhadadi jwara	B.R 4/467-477.p.119

B.R. – Bhaishajya Ratnavali<sup>[28]</sup>

**Table 4: Few important Leha formulations of kantakari**

Sl. No.	Name of the formulation	Dosage form	Indications	Reference
1.	Brahma rasayana	Leha	Rasayana	C.S., Chi 1/41-57.p.378
2.	Chavanaprasha	Leha	Rasayana	C.S., Chi 1/62-72.p.379
3.	Vyaghrihareetaki	Leha	Rasayana, Pinasa, Swasa, Yakshma	BR. P.455
4.	Indroktha rasayana	Leha	Rasayana	C.S., Chi 1:4/13-23.p.388
5.	Vyaghri leha	Leha	Gulma, Hrdroga, Swasa, Kasa	AH. Chi 3/63-66.p.591
6.	Kantakaryavaleha	Leha	Hikka, Kasa, Swasa	BR. 15/182-186.p.457

B.R. – Bhaishajya Ratnavali,<sup>[28]</sup> A.H. – Ashtanga Hridayam;<sup>[29]</sup> C.S. – Caraka Samhita<sup>[30]</sup>

**Table 5: Few important ghrta and taila formulations of kantakari**

Sl. No.	Name of the formulation	Dosage form	Indications	Reference
1.	Kantakari ghrta	Ghrta	Pancha kasa	BR. 15/187.p.457
2.	Baladhi ghrta	Ghrta	Jwara	C.S., Chi 3/224-226.p.420
3.	Neelinyadhi ghrta	Ghrta	Gulma, udharam, kushta, shopha	C.S., Chi 5/105-109.p.441
4.	Dasmooladi ghrta	Ghrta	Gulma	C.S., Chi 5/142.p.443
5.	Panchama haritaki yoga	Ghrta	Rasayana	C.S., Chi 1/76-77.p.380
6.	Vyaghri ghrta	Ghrta	Kasa	B.R. P.478
7.	Vyaghri taila	Tailam (Nasya)	Puthinasa	B.R. P.987, 1086
8.	Vyaghri taila	Tailam	Kasa, Swasa	B.R. P.1086
9.	Dasamooladi ghrta	Ghrta	Kasa	A.H. Chi 3/56.p.590
	Kantakaryadi ghrta	Ghrta	Swasa, Hidhma	A.H. Chi 3/59-62.p.591
10.	Bhringarajadya ghrta	Ghrta	Swara bheda, Kasa	B.R.p.47

B.R. – Bhaishajya Ratnavali;<sup>[28]</sup> A.H. – Ashtanga Hridayam;<sup>[29]</sup> C.S. – Caraka Samhita<sup>[30]</sup>

**Table 6: Other important formulations of kantakari**

Sl. No.	Name of the formulation	Dosage form	Indications	Reference
1.	Dasamooladi hima	Hima	Kasa	AH. Chi 3/45.p.589
2.	Vyaghri swarasa	Swarasa	Kaphaja kasa	AH. Chi 3/48.p.590
3.	Bhramhani gutika	Gutika	Aphrodisiac	C.S.Chi 2:1/24-32.p.391
4.	Dasamoola pralepa	Lepa	Karnamoola sotha	B.R 4/320.p.103

B.R. – Bhaishajya Ratnavali,<sup>[28]</sup> A.H. – Ashtanga Hridayam,<sup>[29]</sup> C.S. – Caraka Samhita<sup>[30]</sup>

## DISCUSSION

Kantakari is used in treating fever, kasa, shwasa etc. Seeds act as expectorant in cough and asthma; roots are used as expectorant and

diuretic and useful in the treatment of catarrhal fever, coughs, asthma and chest pain.<sup>[31]</sup>

Screening the various Ayurvedic classics it was found kantakari is used as a single drug and also as an ingredient in various compound

formulation for various diseases like kasa, shwasa, jwara, swara beda, hiddma, Karnamoola sotha, Gulma, udharam, kushta, shopha, Hrdroga etc.

Solasodine, a spiroketal alkaloidal sapogenin contains a heterocyclic nitrogen atom. It is used for the production of steroidal drugs in pharmaceutical industries. Some reported activities of the drug are antispermatogenic, antidiabetic, dental analgesic, useful in infantile atypical dermatitis and as anticancerous drug.

Kantakari decoction (whole plant) was reported to have significant late suppression of induced immunological oedema, indicating suppression of cell mediated immunity. The suppression of CMI indicates the drug may significantly decrease the traffic of immunologic cells to site of injury either by chemotaxis or by cytolysis. The drug modulates the activity of chemical mediators esp. cytokines involved CMI. In lymph node increase lymphocyte population was observed while decrease in spleen cell population was observed.<sup>[32]</sup>

It has also been reported for antianaphylactic activities and antiandrogenic activities.<sup>[33] to [37]</sup>

Solasodine has anti spermatogenic activity and exhibits hypocholesterolaemic and antiatherosclerotic effect in cholesterol fed rabbits.<sup>[38]</sup> Solasodine have been reported as anticancer, insecticidal,<sup>[39]</sup> antiaccelerator cardiac activities.<sup>[40]</sup> Its chloroform extract has been reported as an antioxidant.<sup>[41]</sup>

The adaptogenic effects of *Solanum xanthocarpum* (Sx) whole plant extracts (Aq-methanol) and steroidal saponins in forced swimming test (FST) and cold restraint stress (CRS) models were investigated in Swiss albino mice. The adaptogenic effects of steroidal saponins were found to be better than those of the total extracts.<sup>[42]</sup>

*S. xanthocarpum* possess effective skin repellent activity against *Cx. quinquefasciatus*.<sup>[43]</sup>

It has also been reported for antianaphylactic activities and antiandrogenic activities.<sup>[33][35][36][37][44]</sup>

Solasodine has anti spermatogenic activity and exhibits hypocholesterolaemic and antiatherosclerotic effect in cholesterol fed rabbits.<sup>[38]</sup> Some further reported activities are Antispermatogenic, antidiabetic, dental analgesic, useful in infantile atypical dermatitis, anticancer.

Toxicity studies on rats have shown that the hot water extract of the drug could be toxic at 200 mg / kg dose. But no clinical data to highlight any toxicity on humans are available.<sup>[38]</sup>

The plant has been reported beneficial in the treatment of asthma and chronic bronchitis.<sup>[45]</sup>

In a clinical study, it was reported that oral administration of *S. xanthocarpum* at a dose of 300 mg dry powder thrice a day for 3 days found to be very effective to controlling mild to moderate bronchial asthma and the bioactivity is equivalent to that of administration of 200 mg of deriphylline.<sup>[46]</sup>

## CONCLUSION

Kantakari is widely used in treating various types of jwara (fever), tamaka swasa (bronchial asthma), kasa (cough) and hikka (hiccough). Lot of formulation containing kantakari as an ingredient in various dosage forms are available. It is used as a single drug in the form of swarasa (fresh juice) and as decoction for treating shwasa. The various researches have proved many of its activities mentioned in Ayurvedic classics giving a strong scientific base.

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