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REVIEW ARTICLE

Kantaka Panchamula – A Forbidden Concept of *Sushurta*

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ABSTRACT

Ayurvedic medicines are based on plants, animals extract and minerals both in single ingredient drugs and compound formulations. Ayurvedic compound formulations are mainly divided into two groups viz. (1) *Kasthausadhi* (predominantly plant drugs) and (2). *Rasausadhi* (predominantly metals and minerals). There are several categories of *Kasthausadhi* formulations such as *Asavaristra*, *Avleha*, *Ghrita Churna*, *Taila* etc. and of *Rasausadhis* such as *Bhasma*, *Pisti*, *Lauha*, *Kupipakva*, *Rasayana* etc. The Ayurvedic drugs are derived from vegetable sources from the various parts of the plant like root, leaf, flower, fruit extrude or plant as a whole. The five well known *Panchmula* are also the root of various drugs. The *Kantaka panchmula* is described broadly by *Acharya Sushurta* first time. The *Karmarda*, *Gokshura*, *Sareyaka*, *Satavari* and *Himsra* are taken as *Kantaka panchmula*. The main reason behind this *Kantaka* name is the presence of *kantaka* ~ thorn in these 5 plants and the *mula* ~ root of these plant is taken.

Key words: Ayurveda, *Kantaka panchmula*, *Sushurta*, *Kasthausadhi*.

INTRODUCTION

The origin of word '*Panchmula'* is first time seen in *Charaka samhita* [1], but broadly description is not found there. Later in *Sushurta samhita* five *Panchamula* named *Brihat Panchamula, Laghu Panchamula, Trina Panchamula, Kantaka Panchamula* and *Valli Panchamula* are given. *Karmarda, Gokshura, Sareyaka, Satavari and Himsra* are included in *Kantaka panchmula* by *Sushurta*. These all five drugs having *kantaka* ~ thorn that's why the name is *Kantaka panchamula*. This group having *Kapha samaka, Rakta-pitta hara* (bleeding disorder), *Sotha hara*(all types of swelling), *Pramehaghna* (all types of diabetes), and *Sukra-doshanashana*(disease of semen) properties [2].

Karmarda **(**Carissa carandas Linn. Family- Apocynaceae) **(Fig 1)**
Synonyms - *Krishnapakphala, Sushena*

Karmarda **root - Macroscopic** – Root considerably long, often irregularly bent, woody, cylindrical; rusty or yellowish-brown; 1-1.5 cm thick; surface smooth; fracture, hard; odor and taste, not distinct. **Microscopic** – Mature root shows a stratified cork, lignified and tangentially elongated cells, consisting of alternating bands of smaller and larger cells; a few inner layers filled with red contents; secondary cortex very narrow, composed of 1 or 2 layers of thin walled cells; secondary phloem composed of usual element having a number of cavities, present in a row just below the secondary cortex; a number of stone cells present in large compact patches in different row, in outer and inner phloem regions interrupting phloem rays; phloem rays uni to biseriate; prismatic crystals of calcium oxalate occur in a number of cells throughout phloem region; cambium not distinct; secondary xylem very wide consisting of xylem vessels, fibers, tracheids and xylem parenchyma, all elements being lignified, xylem rays uni to biseriate, consisting of radially elongated cells; simple, round to oval, starch grains measuring 5.5-11 μ in dia., present throughout [3].

Gokshura (Tribulus terrestris Linn. Family – Zygophyllaceae) **(Fig 2)**
Synonyms – *Khuraka, Trikantaka, Swadukantaka, Gokantaka, Gokshuraka, Vansringata, Palankasha, Svadanstra* and *Ikshugandhika*.
Gokshura **root - Macroscopic –** Drug consist of root, 7-18 cm. long and 0.3 -0.7 cm. in diameter, slender, cylindrical, fibrous, frequently branched bearing a number of small rootlets, tough, woody

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and yellow to light brown in colour; surface becomes rough due to presence of small nodules; fracture fibrous; odor aromatic; taste, sweetish and astringent.

Microscopic- Transverse section of primary roots show a layer of epidermis followed by 4-5 layers of thin walled parenchymatous cortex, endodermis distinct; pericycle enclosing diarch stele, in mature root, cork 4-6 layered, cork cambium single layered followed by 6-14 layers of thin walled parenchymatous cells with varying number of fibers, distributed throughout; some secondary cortex cells show secondary wall formation and reticulate thickening; fibers found in groups resembling those of phloem; secondary phloem divided into two zones, outer zone characterized by presence of numerous phloem fibers with a few sieve tube slightly collapsed, inner zone frequently parenchymatous, devoid of fibers often showing sieve tubes and companion cells; phloem rays distinct, few cells get converted into fibers and traversed by medullary rays; vessels scattered, arranged in singles or long, narrow with simple pits; xylem parenchyma rectangular or slightly elongated with simple pits and reticulate thickening; xylem fibers few; tracheids elongated with simple pits; medullary rays heterogenous, 1-4 cells wide; starch grains and rosette crystals of calcium oxalate present in secondary cortex, phloem and medullary rays cells; few prismatic crystals also present in xylem ray cells [4].

Sareyaka (Barleria prionitis Linn. Family – Acanthaceae) **(Fig 3)**

Synonyms – *Kurantaka*

Sareyaka root - Macroscopic – Well developed, upto 1 cm. thick at the top, cylindrical and tapering, bearing lateral branches and numerous rootlets; surface rough due to numerous dot like lenticels and root scars of fallen roots; external surface grayish brown, bark thin with smooth internal surface; wood cream coloured; fracture, hard and laminated; odour and taste not characteristic. **Microscopic** – Mature root shows cork of 6-25 layers of thin walled, tangentially cells; cork cambium single layered; secondary cortex composed of large, tangentially elongated, parenchymatous cells with small intercellular spaces; secondary phloem consist of sieve tubes, companion cells, phloem parenchyma, and traversed by phloem rays, phloem fibers found scattered throughout phloem region in single and groups, single fibers elongated, thick walled with narrow lumen; secondary xylem wide, vessels, tracheids, parenchyma, xylem fibers present; vessels, pitted, with transverse to oblique articulation; tracheids slightly broader in middle with tapering ends having pitted walls; xylem fibers thick walled, lignified and pitted; xylem parenchyma rectangular with lignified walls; xylem rays uni to biseriate, uniseriate rays more common [5].

Satavari **(***Asparagus racemosus* Willd. Family – Liliaceae) **(Fig 4)**

Synonyms – *Bahusuta, Bhiru, Vari, Narayani, Satpadi* and *Satavirya*

Satavari **root - Macroscopic** – Root tuberous, 10-30 cm. in length and 0.1 to 0.5 cm. thick, tapering at both ends with longitudinal wrinkles; colour cream; taste, sweetish. **Microscopic** – Shows an outer layer of piliferous cells, ruptured at places, composed of small, thin walled rectangular asymmetrical cells, a number of cells elongated to form unicellular root hairs, cortex comprises of 25 to 29 layers, distinct in two zones, outer and inner cortex; outer cortex consist of 6 or 7 layers, compactly arranged, irregular to polygonal, thick walled, lignified cells; inner cortex comprises of 21 to 23 layers, oval to polygonal, thin walled, tangentially elongated cells with intercellular spaces; stone cells, either slightly or in groups, form a discontinuous to continuous ring in the upper part of this region; raphides of calcium oxalate also present in this region; 2 or 3 layers of stone cells encircle the endodermis; endodermis composed of thin walled parenchymatous cells; pericycle present below endodermis; stele exarch and radial in position; xylem consist of vessels, traceides and parenchyma; xylem vessels have pitted thickening; phloem patches consist of usual element; pith composed of circular to oval parenchymatous cells, a few cells slightly lignified [6].

Himsra **(**Capparis sepiaria Linn. Family – Capparidaceae) **(Fig 5)**

Synonyms – *Gridhnakhi, Kantari*

Hinsra **root - Macroscopic** – Root pieces are upto 5.5 cm. in thickness; bark rough to touch, thick showing longitudinal lenticels; freshly broken surface light yellowish; wood hard and compact; remnants of robust and slender rootlets present on the bark; colour varies from pale yellow to reddish brown; no particular odour or taste.

Microscopic – A transverse section of root characterized by outermost layer of slightly suberised corky zone of several layers showing

irregular and broken outline; cork cambium made of 4 or 5 layers of thin walled, small, squarish cell; cortex consisting of thin walled, irregular or somewhat tangentially elongated cell; angular sclereids in group of 2 to 3 and upto 30 μ in size scattered in cortex; phloem in the form of multiple layers of cells forming a continuous cylinder around inner vascular zone, separated from the xylem by 4 to 5 layers of vascular cambium; wedge of vascular elements with thick walled cells span the centre of the root and the outer zone; vessels isolated or in the group of two, distributed uniformly among xylem parenchyma, which has granular contents; medullary rays of thin walled, mostaly uniseriate, rectangular cells, often having granular contents; pith absent [7].

Fig 1: Fruiting Plant of *Karmarda* (*Carissa carandas* Linn.)

Fig 2: Plant of *Gokshura* (*Tribulus terrestris* Linn.)

Fig 3: A flowering plant of *Sareyaka* (*Barleria prionitis* Linn.)

Fig 4: Plant of *Satavari* (*Asparagus racemosus* Willd.)

Fig 5: Plant of *Himsra* (*Capparis sepiaria* Linn.)

Properties of different drug in *Kantaka Panchamula*:

Drug	*Rasa*	*Guna*	*Virya*	*Vipaka*
Karmarda [8]	*Amla*	*Guru, Sara*	*Ushna*	*Katu*
Gokshura [9]	*Madhur*	*Guru, Snigdha*	*Sita*	*Madhura*
Sareyaka [10]	*Tikta, Madhura*	*Laghu*	*Ushna*	*Katu*
Satavari [11]	*Madhura, Tikta*	*Guru, Snigdha*	*Sita*	*Madhura*
Himsra [12]	*Tikta, Katu*	*Laghu, Ruksha*	*Ushna*	*Katu*
Kantaka Panchamula	*Amla, Madhura, Tikta, Katu*	*Guru, Snigdha, Laghu, Ruksha*	*Sita/Ushna*	*Madhura/ Katu*

DISCUSSION

***Karmarda* -** The phytochemical screening of the extract revealed the presence of small quantities of alkaloids, flavonoids, saponins and large amounts of cardiac glycosides, triterpenoids, phenolic

compounds and tannins. Based on the present state of knowledge of the chemical constituents of the extract, it is not possible to attribute with certainty its anticonvulsant effect to one or several active principles among those detected in the screening. However, triterpenic steroids and triterpenoidal saponins are reported to possess anticonvulsant activity in some experimental seizure models such as MES and PTZ [13, 14].Some alkaloids, monoterpenes, flavonoids also have protective effects against PTZ, picrotoxin and NMDLA-induced convulsions [15-18]. Karunakar Hegde et al reported Anticonvulsant Activity of *Carissa carandas* Linn. Root Extract in Experimental Mice [19]. Karunakar Hegde and Arun B Joshi reported Hepatoprotective effect of *Carissa carandas* Linn. Root Extract against CCl4 and Paracetamol induced hepatic oxidative stress [20]. Aye Aye Naing reported that *Carissa carandas* L. can be effective in the formulation of medicine for the treatment of diseases, such as pathogenesis, alimentary tract, gastrointestinal tract, skin infection, sores, Candida sis and intense itching [21].

Gokshura **-** Saied Kianbakht and Fereshteh Jahaniani reported The activity of the plant against both gram-positive and gram-negative bacteria may be indicative of the presence of broad spectrum antibiotic compounds or simply general metabolic toxins in the plant. Since Ira-nian *T. terrestris* demonstrates activity against the most prevalent gram-negative bacteria in urinary infections namely *E. coli*, the use of the plant as a urinary anti-infective is validated [22].

Tribulus terrestris possesses tonic properties, antibacterial, anti-inflammatory, smooth muscle relaxation and diuretic actions, which are useful in genitourinary infections, painful micturation, hematuria, dysuria, benign prostatic hyperplasia, urethritis and prostatitis [23-27].

It has been reported that *Tribulus terrestris* contains saponins, quercetin, kaempferol, rutin, furostanol, gigenin, hecogenin, ruscogenin, gitogenin, tigonenin, terrestrinins A (1) and B(2), which are known to have antioxidant and anticancer properties [28-30]. Kumar Manish et al reported that *Tribulus terrestris* root extract pretreatment has provided protection against the hematopoietic damage [31].

Sareyaka **-** Khadse C. D. and Kakde R. B. repoted that Preliminary phytochemical screening of root extracts of B.prionitis revealed the presence of flavonoids, steroids, glycosides, alkaloids and carbohydrates. All the extracts were preliminary screened for in-vivo anti-inflammatory activity and AQSE was found to be most active among all extracts [32]. P.D. Diwan and Y.A.Gadhikar confirmed antimicrobial potential of the plant *Barleria prionitis* L., thus supporting its folklore application as preventive remedy against oral microbial diseases [33]. Shukla P. Reported it can be used for development of new antibacterial drugs. As callus of shoot tips as well as leaves showed more antibacterial activity than field grown plants, in vitro propagated plants would be more beneficial for drug development than filed grown plants [34].

Satavari **-** K.Ravishankar et al. reported that *Asparagus racemosus* root extract has good significant antibacterial activity against *Staphylococcus aureus, Bacillus subtilis, Staphylococcus werneri, Pseudomonas putida, Pseudomonas aeruginosa, Proteus mirabilis* .The antibacterial activity of root extract with different concentrations 100 , 300 and 500mg/ml was very well compared with standard reference drug Gentamycin 25 µg/ml [35]. V. Ashajyothi et al. found that rats fed with *Asparagus racemosus* root powder (0.5 g/kg rat feed) for 21 consecutive days exhibited significantly high testes weights as compared to untreated controls. This however, is an isolated report and can be investigated further to broaden our understanding regarding the effect of *Satavari* on the male reproductive system as well [36]. N. Venkatesan reported that the ethanol and aqueous extract of *Asparagus racemosus* possesses significantanti-diarrhoeal activity due to its inhibitory effect both on gastrointestinal propulsion and fluid secretion [37]. H.R. Chitme *et al*. reported that Asparagus racemosus shall be considered as safe and effective antiosteoporosis in the treatment of postmenopausal condition [38]. The use of this plant in the treatment of osteoporosis not only encounters orthopedics practice, but may also alleviated common symptoms such as backache, joint swelling, pain and stiffness as reported by earlier study [39-41]. The use of *Asparagus racemosus* is also appeared to be safe for longterm usage, as there were no short term and long term toxicity reports [42].

Himsra **-** V. Madhavan reported that both the aqueous and ethanol extracts of the roots of C. sepiaria possess hepatoprotective activity. Ethanol extract showed better protection from hepatotoxicity and the histopathology observations further supported the above fact. The hepatoprotective action may be exerted due to the presence of certain bioconstituents like

flavonoids, alkaloids, saponins. Bioactivity guided isolations followed by further studies are required to understand the exact mechanism and constituents responsible for the hepatoprotective activity [43]. The observations made during acute toxicity studies indicated that this drug possesses both CNS stimulant (ethanol extract) and depressant (aqueous extract) properties. Alkaloids, phytosterols, flavonoids, saponins have been reported to possess hepatoprotective property .The presence of such phytoconstituents in the roots of *C. sepiaria* may be responsible for the hepatoprotective property of this drug [44-47]. Varadharajan Madhavan *et al*. reported that both ethanol and aqueous extracts of the roots of *C. sepiaria* exhibited significant hepatoprotective activity. The ethanol extract produced better protection from hepatotoxicity, which may be due to the presence of phytosterols. Histopathological studies confirmed these findings. This study provided evidence to support the use of the roots of *C.sepiaria* as a potential drug for the treatment of hepatotoxicity [48].

CONCLUSION

This group having *Kapha samaka*, *Rakta-pitta hara* (bleeding disorder), *Sotha hara* (all types of swelling), *Pramehaghna* (all types of diabetes), and *Sukra-doshanashana*(disease of semen) properties according to Ayurveda. Individual drug in *Kantaka panchamula* taken as research and also proved these properties, But till present no any research found in which *Kantaka panchamula* is given as trial drug, so further research is required to prove this. This paper will be a milestone for the further research in this grey area of *Kantaka panchmula*.

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