

## REVIEW ON PLANTS MAINLY USED FOR THE PREPARATION OF KSHAR SUTRA

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### Abstract

Many herbal remedies individually or in combination have been recommended in various medical treatises for the cure of different diseases. Ksharsutra- an Ayurvedic para-surgical measure is used the treatment of *Nadi Vrana* (sinus), *Bhagandara* (fistula- in - ano), *arbuda* (excision of small benign tumour) etc. by using different medicinal plants. The standard kshar sutra is prepared by using *snuhi ksheera* (latex of *Euphorbia nerrifolia* Linn), apamarg kshar (water extract of ashes of *Achyranthus aspera* Linn plant) and haridra powder (powder of *Curcuma longa* L). This review mainly focuses on the plants that are used in preparation of Ksharsutra so that more research work is carried out in the direction of standardization, therapeutic level determination of Ksharsutra plants.

**Keywords:** Kshar Sutra, para-surgical measure, Fistula-in-ano, *Euphorbia nerrifolia* Linn, *Achyranthus aspera* Linn, *Curcuma longa* L

### Introduction

Ayurveda is the most ancient health care system and is practiced widely in India, Sri Lanka and other countries. According to the WHO survey 80% of the populations living in the developing countries rely almost exclusively on traditional medicine for their primary health care needs. Exploration of the chemical constituents of the plants and pharmacological screening may provide us the basis for developing the leads for development of novel agents. In addition, herbs have provided us some of the very important life saving drugs used in the armamentarium of modern medicine. However, among the estimated 250,000-400,000 plant species, only 6% have been studied for biological activity, and about 15% have been investigated phytochemically(1). *Kshar Sutra* is a Sanskrit phrase in which *Kshar* refers to anything that is corrosive or caustic; while *Sutra* means a yarn or thread (The origin of the English word "Sew"). It is described in one of the most ancient medicine known to mankind that is - Ayurved, which

originated and flourished in India. Ayurveda is still at its peak in India and gaining a great popularity worldwide. The *Ksharsutra* was first mentioned by the "Father of Surgery" Sushruta in his text named *SUSHRUT - SAMHITA* for the treatment of *Nadi Vrana* (sinus), *Bhagandara* (fistula- in - ano), *arbuda* (excision of small benign tumour) etc. Although *Brihatrayi*- the chief three texts of Ayurveda mention the use of *kshara sutra*, there is no description of their preparation. It was *Chakrapani Dutta* in late eleventh century who has mentioned in his book *Chakradatta*, the method of preparation with a clear-cut indication of its use in *bhagandara* and *arsha* (haemorrhoid) for the first time. He explains the method that by smearing a sutra (thread) repeatedly in the latex of *snuhi* and *haridra* (turmeric) powder makes the kshara sutra. Later authors like Bhavamishra, Bhaisajyaratnavali etc. also mention the same method. But because of brevity of preparation and inadequate explanation of procedure of application, it

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lost its popularity among Ayurvedic surgeons (2-4).

### Types of Kshar Sutra

In the textual reference of *Chakradatta* and *Rasatarangini* we get only indication of the thread made up of *Snuhi*, *apamarga* and Turmeric. Susruta describes about many kind of Kshars like *Karaveera*, *Palasa*, *Kadali* etc. in *Susruta Samhita*. So many studies have already carried out with variations in the Kshara and the latex. The most remarkable are Guggulu Ksharasutra, Udumbara Ksharasutra, Gomutra Ksharasutra, Papaya Ksharasutra, Ksharasutra prepared with *Ficus carica* latex etc (4-5).

### Method of Preparation

The standard kshar sutra is prepared by repeated coatings of *snuhi ksheera* (latex of *Euphorbia Neriifolia* Linn), *apamarg kshar* (water extract of ashes of *Achyranthus aspera* Linn plant) and haridra powder over a surgical linen thread no. 20. This thread is spread throughout lengthwise in hangers. Each thread on the hanger is then smeared with *snuhi* latex with the help of gauze piece soaked in the latex.

Kshara sutra cabinet has a source of hot air with regulated temperature to dry the thread and an Ultra Violet light that is used for sterilization. This wet hanger is transferred in kshar sutra cabinet for drying and sterilization. Same process is repeated next day. Eleven such coatings with *snuhi ksheera* alone should be accomplished. The twelfth coating is done by first smearing the thread with *ksheera* and in wet condition thread is passed through the *apamarg kshar*. It is again transfer into the cabinet for drying and sterilization. This process is repeated till seven coatings of *snuhi ksheer* and *apamarg kshar* is achieved. Final three coating are completed with *snuhi ksheera* and fine powder of turmeric in the same fashion. Thus twenty-one coatings over the thread are completed (6).

### Mode of Action

Kshar Sutra is now a popular treatment modality in India for the management of fistula in ano. Many Clinical trials have been carried out in different institutes to evaluate the action of Kshara sutra in various disease conditions. The countries like Srilanka and Japan have also conducted many clinical trials and established the action of this thread. According to Ayurveda the action of Kshar sutra is thought to be due to its healing and cleansing effect in the local area where it is applied. It can be suggested that due to the anti microbial action and as a *saton* it allows the proper drainage of pus from the fistula that leads to a proper healing. On the other hand the cutting effect of thread incises the skin gradually without a surgical incision. Many studies confirm that it is more effective in the way of reducing hospital stay and less infection than the conventional *saton* therapy. Researchers suggest that it is having the action of Excision, Scrapping, Draining, Penetrating, Debridement, Sclerosing, Healing, Bactericidal and Bacteriostatic (6).

### *Euphorbia neriifolia* L.

*Euphorbia neriifolia* Linn (Euphorbiaceae) is found throughout the Deccan Peninsula of India and commonly occurs in the dry hilly rocky grounds of north, central and south India. It is an herb full of spine, and is popularly known as *sehund* or *thohar* in Hindi. Ayurveda describes the plant as bitter, pungent, laxative, carminative, improves appetite, as well as useful in abdominal problems, bronchitis, tumours, loss of consciousness, delirium, leucoderma, piles, inflammation, enlargement of spleen, anaemia, ulcers and fever. Its leaves, in the Indian traditional system, are used as aphrodisiac, diuretic, and also in cough and cold, bleeding piles and ano-rectal fistula (7). Plants of *euphorbia* species show anticarcinogenic activity due to the presence of several terpenes, anthocyanins, alcohols and

steroids; diterpenoid ingenol 3,20-dibenzoate and phorbol 12-tiglate 13-decanoate isolated from Euphorbiaceae plants show antileukaemic activity against the P-388 lymphocytic leukaemia in mice (8). Euphol, a triterpene alcohol from the roots of *Euphorbia kansui*, has inhibitory activity against mice skin tumour (9). *E. neriifolia*, being widely available in large quantities, is potentially a low-cost source of active therapeutic substances. We have previously reported on the mild CNS depressant, wound healing and immunomodulatory activities of the hydroalcohol leaf extract (10-12). Little phytopharmacological work, however, has been done on the medicinal application of the leaf. Saponin isolated from the leaf possesses good haemolytic and in-vitro antioxidant activity but it is devoid of antibacterial activity up to 10 mg/ml concentration (13). *Euphorbia neriifolia* leaves are used as aphrodisiac, diuretic and also used in the treatment of bronchitis, bleeding piles and in ano-rectal fistula. The tribal population of Chattishgarh region uses the milky latex as an ingredient of aphrodisiac mixture (7, 14). The aqueous extract of the latex of *Euphorbia neriifolia* facilitated the wound healing process as evidenced by increase in tensile strength, DNA content, epithelization and angiogenesis (15). *E. neriifolia* Leaf is rich in crude sapogenin, and euphol (0.023 %) was identified as a major constituent. The sapogenin fraction showed antioxidant, radioprotective and cytotoxic activity against malignant melanoma cells (16). Natives of Chhattisgarh use externally boiled 'thohar' milk in castor oil with salt to cure the deep cracks in soles of legs. The milk of 'thohar' is also used commonly like aloe gel in case of burns. 'thohar' milk can be used successfully for healing of wounds. Application of lukewarm 'thohar' leaves reduces itching pain and swelling in piles (17). *E. neriifolia* hydroalcoholic extract was found to contain sugar, tannins,

flavonoids, alkaloids triterpenoidal saponin on preliminary phytochemical analysis. Several triterpenoids like Glut-5-en-3 $\beta$ -ol, Glut 5(10)-en-1-one, taraxerol and  $\beta$ -amyirin has been isolated from powdered plant, stem and leaves of *E. neriifolia* (18-19). Antiquorin have been isolated from ethanol extract of fresh root of *E. neriifolia* (20). Neriifolione, a triterpene and a new tetracyclic triterpene named as nerifoliene along with euphol were isolated from the latex of *E. neriifolia* (21).

#### ***Achyranthes aspera* L.**

*Achyranthes aspera* Linn. (Amaranthaceae,) is commonly found as a weed on way side and at waste places throughout India. The plant is reported to yield a water-soluble base and a chloroform soluble base. The former was earlier designated as achyranthine (22). It was characterized as a betaine derivative of N-methylpyrrolidine-3-carboxylic acid (22). Later studies showed that the water-soluble base was betaine and not achyranthine (23). The chloroform soluble basic fraction was shown to be a mixer of two uncharacterized alkaloid entities (24). The ethanol extract of the plant contained alkaloids and saponins while flavonoids and tannin were found absent (25). The shoot yielded a new aliphatic dihydroxyketone, characterized as 36, 47-dihydroxyhenpentacontan-4 one together with tritriacontanol (26). An essential oil; a new long chain alcohol characterized as 17-pentatriacontanol four new compounds characterized as 27-cyclohexylheptacosan-7-ol, 16-hydroxy-26 methylheptacosan-2-one, 4-methylheptatriacont-1-en-10-ol and tetracontanol-2 (27-28). The chloroform extract of the stem led to the isolation of n pentatriacontan, 6-pentatriacontanone, hexatriacontane and triacontane (29). The inflorescence is reported to contain flavonoids and alkaloids (30). The defatted seeds are reported to yield a saponin in a yield of 2%, which was identified as oleanolic acid- oligosaccharide. The sugar

moiety of the saponin was composed of glucose, galactose, xylose and rhamnose (31-33). Isolated a crude sapogenin fraction from the seeds yielded oleanolic acid (34). Later, investigation led to the isolation of two oleanolic acid based saponins, saponin A and saponin B which were characterized as  $\alpha$ -L-rhamnopyranosyl (1 $\rightarrow$ 4)- $\beta$ '-D-glucopyranosyl (1 $\rightarrow$ 4)- $\beta$ '-D-glucuronopyranosyl (1 $\rightarrow$ 3)-oleanolic acid and  $\beta$ -D-galactopyranosyl (1 $\rightarrow$ 28) ester of saponin A, respectively (35). In another study, the total saponins were hydrolysed with acid and the genin was identified as oleanolic acid (35). A rapid procedure for the separation of triterpenoid saponin based on partition chromatography from the plant has been described (36). The seeds are reported to contain hexatriacontane, 10-octacosanone, 10-triaicosanone and 4-triacontanone (29). The root of the plant was found to contain alkaloids but indicated absence of saponin and tannins (37-38). In yet another preliminary chemical study, the root was reported to contain alkaloids, flavonoids, saponins, steroids and terpenoids. Glycosides were found to be absent (39). Isolation of  $\beta$ -sitosterol was also reported from the root (38). Various parts of the plant, viz., seeds, stem, leaves and root are reported to contain ecdysterone (40-41). A new six compound isolated from the ethanol extract of the roots are strigmast-5, 22 dien-3- $\beta$ -ol, trans-13-docasenoic acid, n-hexacosanyl n-decanate, n-hexacos-17-enoic acid, n-hexacos-11-enoic acid and n-hexacos-14-enoic acid (38). *Achyranthes aspera* showed various pharmacological activity like Anti-microbial activity (42-26), Anti-inflammatory activity (47-49), Immunomodulatory activity (50-54), Anti-fertility activity (55-65), Anti-hyperlipidemic activity (66), Anti-feedant activity (67), Anti-diabetic activity (68-69), Diuretic activity (70), Cardiovascular system activity (71-73), Anti-carcinogenic

activity (74), analgesic and antipyretic (75).

#### ***Curcuma longa* L.**

*Curcuma longa* L. (Zingiberaceae) family is a medicinal plant extensively used in Ayurveda, Unani and Siddha medicine as home remedy for various diseases (76-77). *C. longa* L., botanically related to ginger, is a perennial plant having a short stem with large oblong leaves and bears ovate, pyriform or oblong rhizomes, which are often branched and brownish-yellow in colour (76). Traditional uses turmeric powder for the treatment of biliary disorders, anorexia, coryza, cough, diabetic wounds, hepatic disorders, rheumatism and sinusitis (78). In China, *C. longa* is used for diseases associated with abdominal pains (79). Curcumin, the ethanol extract of the rhizomes, sodium curcumin, [feruloyl-(4-hydroxycinnamoyl)-methane] (FHM) and [bis-(4-hydroxycinnamoyl)-methane] (BHM) and their derivatives, have high anti-inflammatory activity against carrageenin-induced rat paw oedema (80-81). Curcumin is also effective in formalin-induced arthritis (80). Curcumin reduces intestinal gas formation (81) and carbon tetrachloride and D-galactosamine-induced glutamate oxaloacetate transaminase and glutamate pyruvate transaminase levels (82-83). It also increases bile secretion in anaesthetized dogs (84) and rats (85), and elevates the activity of pancreatic lipase, amylase, trypsin and chymotrypsin (86). Curcumin protects isoproterenol-induced myocardial infarction in rats (87). Curcumin, FHM and BHM also have anticoagulant activity (88-89). Curcumin and an ether extract of *C. longa* have hypolipemic action in rats (90) and lower cholesterol, fatty acids and triglycerides in alcohol induced toxicity (91). Curcumin is also reported to have antibacterial (81), antiamebic (92) and anti HIV activities (93). Curcumin also shows antioxidant activity (94-97). It also shows antitumour (98-100) and anticarcinogenic (101-104)

activities. The volatile oil of *C. longa* shows anti-inflammatory (105), antibacterial (106-107) and antifungal activities (108). The petroleum ether extract of *C. longa* is reported to have antiinflammatory activity (108). Petroleum ether and aqueous extracts have 100% antifertility effects in rats (109). Fifty per cent ethanolic extract of *C. longa* shows hypolipemic action in rats (110). Ethanolic extract also possesses antitumour activity (111). Alcoholic extract and sodium curcumin can also offer antibacterial activity (81-84). The crude ether and chloroform extracts of *C. longa* stem are also reported to have antifungal effects (112). A *C. longa* fraction containing ar-turmerone has potent antivenom activity (113). *C. longa* also shows adjuvant chemoprotection in experimental forestomach and oral cancer models of Swiss mice and Syrian golden hamsters (114). Curcumin also increases mucin secretion in rabbits (115). Turmeric contains protein, fat, minerals, carbohydrates and moisture. The essential oil obtained by steam distillation of rhizomes has *a*-phellandrene, sabinene, cineol, borneol, zingiberene and sesquiterpenes. Curcumin (diferuloylmethane) is responsible for the yellow colour, and comprises curcumin I, curcumin II and curcumin III (116-119).

## CONCLUSION

Major thrust by whole of the pharmaceutical industry is focused towards design and development of new innovative/indigenous plant based drugs through investigation of leads from traditional system of medicine. In recent years, ethno-botanical and traditional uses of natural compounds, especially of plant origin received much attention as they are well tested for their efficacy and generally believed to be safe for human use. Thorough screening of literature available on Kshar sutra depicted the fact that it is a popular remedy among the various ethnic groups, Ayurvedic and traditional practitioners for treatment. Researchers are

exploring the therapeutic potential of these plants as it has more therapeutic properties which are not known.

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