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PHYTO – CHEMISTRY AND PHARMACOLOGY OF SHANKAPUSHPI – FOUR VARIETIES

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ABSTRACT: *Pharmacognosy, Pharmacology, Clinical studies and photochemistry of the four plants, viz., Convolvulus pluricaulis, Evolvulus alsinoides, Canscora decussate and Clitoria ternatea commonly used as the drug Shankapushphi have been reviewed here.*

Shankapushpi, an important Ayurvedic drug is reputed as an alterative, laxative and brain tonic. It occurs as an ingredient in Brahmarasayana, Aindrarasayana, Agastyaharitaki, Medhyarasayana, Manasamitram and in a number of other composite drugs. The names Sankhanamni, Sankhaphuli, Kiriti, Kambu Malini, Kambu Puspi Smritihita, Medhya and Vana Vilasini are synonymous with the name Shankapushpi. In Ayurvedic texts it is described under the bitter group of drugs, i.e. drugs of *Vyadhignadi* and *Guducyadi* group[1,2].

Four plants referred to as "Shankapushpi" in literature on Indian Medicinal Plants are:

i) *Convolvulus pluricaulis* Chois. (Syn. *C. microphyllus* Sieb)
ii) *Evolvulus alsinoides* L. (Syn. *E. linifolius* L)
iii) *Canscora decussate* Roem. Et. Schult (Syn. *Pladera decussate* Roxb).
iv) *Clitoria ternatea* (Syn. *C. Philipensis* Perr,)

In this article the pharmacological activities and phytochemistry of those plants has been reviewed. A brief account of their habitant, therapeutic uses and chemical constituents are given in the Table (1).

Pharmacognosy

Sanskrit texts describe 'Sankapushpi' as a prostrate herb with conch-like white flowers occurring in forests. Market samples of the drug from some centres of Central, Western and Northern India yielded *C. pluricaulis* (plate No.1) and *E.alsinoides* (Plate No. 2) as the two sources of the drug[3]. Yoganarasimhan and co-workers4 have also identified the Shankapushpi used in Karnataka as *E.alsinoides.* In the "Kerala Sampradaya", *C. ternatea* (Plate No.3) is used as Shankapushpi, while majority of the Bengali practitioners believe it to be *C.decussata*[1] (Plate No.4).

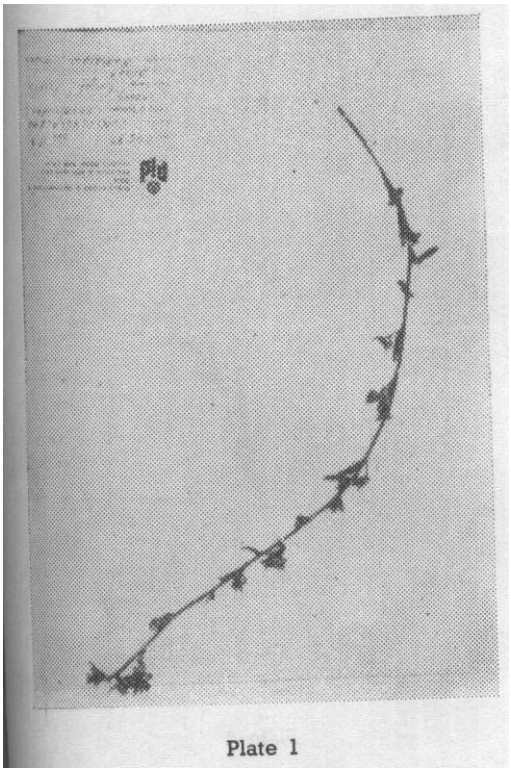

Plate 1

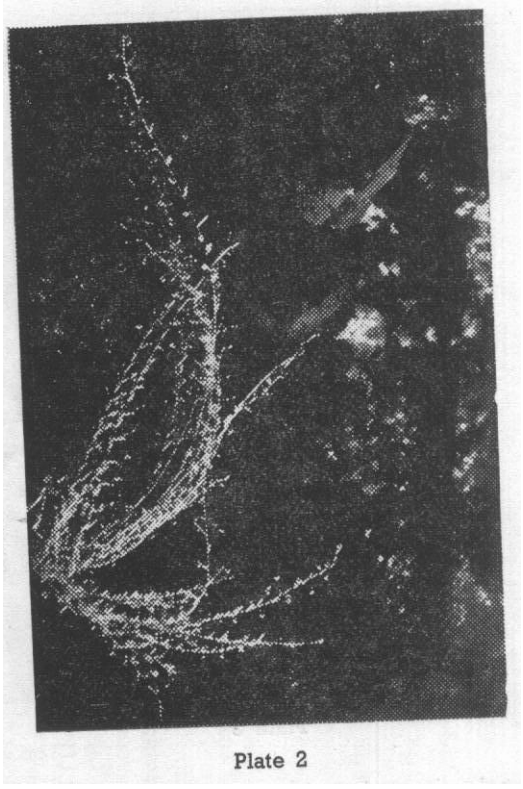

Plate 2

Plate 3

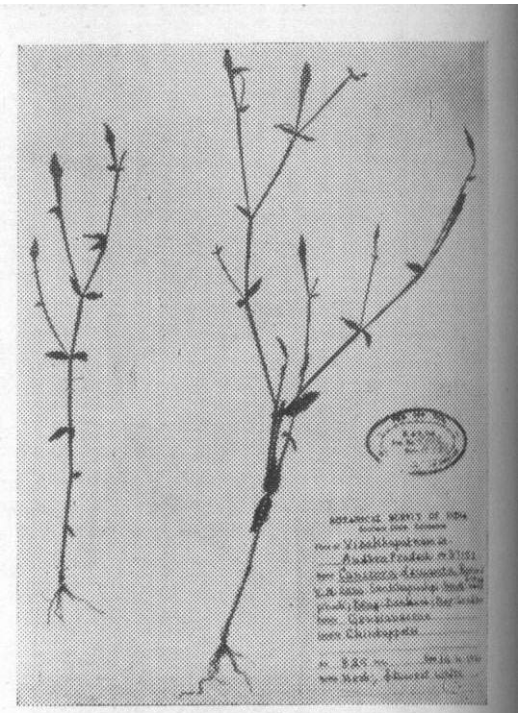

Plate 4

Pharmacology

(a) *Anti-microbial activity:*

E. alsinoides exhibited anti-bacterial activity. A number of xanthone derivatives including mangiferin (a. zanthone-6-glusoside) isolated from *C.decussata* exhibited anti-tuberculosic activity against *Mycobacterium tuberculosis* and were found to be very potent. Their action was almost equivalent to that of streptomycin[5]. The alcoholic extracts of *E. alsinoides* were effective against *Microocus pyogenes* var. *aureus, Sarcinia lutea Escherischia coli, Salmonella typhosa* and *Shigella dysenteriaes* var. *shiga*[6]. Antifungal activity was exhibited by *C. pluricaulis* and *E. alsinoides.* Alcoholic extractives of leaves and flowers of *C. pluricaulis* inhibited the growth of the fungi *Pestalotia elasticae, Curvularia lunata* and *Fusarium moniliformae*[7]. Aqueous extracts of the fresh petals of *C. pluricaulis* and *E. alsinoides* were found to be almost completely fungicidal against three pathogens, viz., *Alternaria brassicae, A. brassicola* and *Fusarium oxysporum.* Chromatographic analysis of the petal extracts indicated the presence of some unknown flavonoids which may prove to be broad spectrum antibiotics[8]. Alcoholic

extracts of *C. decussate* exhibited antiviral activity against Ranikhet diseases virus[9].

(b) *CNS and cardio-vascular activity:*

The alcoholic extract of *C. decussata* had CNS depressant activity in mice, produced a fall in BP and stimulated the smooth muscles of rabbit intestine and uteri of rats and guinea pigs. It enhanced the effect of acetycholine on skeletal muscles. At the dose levels of 50, 100 and 200 mg/kg. body weight, mangiferin from *C. decussate* produced signs of CNS depression characterized by decreased spontaneous motor activity sedation and ptosis when administered intraperitonially as a suspension in 2% gum acacia[10]. The extract of *C. pluricaulis* (50 mg/kg, 250 mg/kg, 500 mg/kg. 1 g/kg. body weight) showed slight sedative but no analgesic and anticonvulsive effect in rats. It decreased the BP in dogs. The hypotensive effect could not be blocked by mepyramine maleate indicating that the plant has no histaminic activity[11]. When tested for its psychotropic effect in albino rats (50 mg/100 g body weight) it showed significant barbiturate potentiation effect[12]. At the dose 12 mg/kg and 24 mg/kg tested on dogs, maximum hypotensive action of the drug was observed in leaves (including flowers)[13]. At the dose of 100 mg / 100 g, its barbiturate potentiation effect on albino rats, though less than the standard psychotropic drug Diazepam (1 mg/100 g), was more than that of "Mandookarpani" *(Hydrocotyle asiatica)*, providing its superiority as a Medha (intelligence) drug[14]. The alcoholic extract of leaves and flowers in the dose 300 mg/kg (short term) and 1.20 g/kg (long term) given to albino rats resulted in the decrease in the level of acetylcholine, histamine and catecholamines and also induced a definite psychoneurotropicaction[15]. Spontaneous motor activity and fighting response of mice was abolished without affecting the escape response. The electrically induced convulsive seizures and tremorine-induced tremours were antagoinsed by the extract[16].

Administration of alcoholic extracts of *E. alsinoides* in moderate doses (200 mg/kg) to albino mice induced abnormal behaviour. Drowsiness, stupor, and less motility were observed in all the animals. At moderately higher doses, scratching and increased respiratory rates were observed. The ED 50 and LD 50 values of the extracts were 450 mg/kg and 7g/kg respectively when administered orally. This shows that the drug is neither toxic nor lethal[17]. The base obtained from the acetone soluble fraction in low doses (0.02 mg) decreased heart rate and force of cardiac contraction in pithed frog heart and isolated rabbit intestinal loop. In larger doses (0.1 mg) it caused cardiac arrest in diastole. It decreased the amplitude of contraction and increased the tone of intestinal muscle in concentration of 1: 500,000 to 1:250,000[9]. In contrast, evolving hydrochloride isolated from this plant exhibited sympathomimetic activity in the preliminary test. The effect on BP, spleen volume and respiration on systemic administration (1 mg/kg) of the drug resembled that of 0.1 ml, 1 : 10,000 adrenaline, though the BP was elevated for a longer time. The intensity of response was not proportionate when the dose was raised to 2 mg/kg. Neither repetition of the same dose nor an increase in dose range was found to improve the responses. Intracorticoid injection of the drug (1 mg) produced a rise in BP sustained for an appreciable time. Effects on respiration were not significant[18].

(c) *Other activities*

Soluble crystalline fractions from alcoholic and aqueous extracts of *C. decussate*

exhibited spermicidal activity. Rat sperms were killed in 5 min by a concentration of 1 : 50,000 alcoholic and 1 : 20,000 aqueous extract of this plant. Human sperms required larger doses[9].

At the dose of 50 mg/kg, mangiferin from *C.decussata* produced significant anti inflammatory effect in rats as tested by carrageenin-induced hind paw oedema, cotton pellet implantation and granuloma pouch.[10]

Experimental evaluation of *C.ternatea* – treated albino rats showed that free HCI and total acid were significantly reduced as compared to the control group.[19]

The seed extract of *C.ternatea* showed haemolytic agglutinating reaction with human blood.[20]

An experimental study on albino rats showed that increasing doses of the drug Shankapushpi (plant source not mentioned) does not increase onset of action and total duration of sedation. The lowest and effective doses of the drug are 10 mg and 25 mg/100 g body weight of rats respectively. These doses are capable of potentiating the Nembutal hypnosis 1 ¾ times 21.

Clinical studies

Out of the four plants, only *C.pluricaulis* has been investigated clinically. At the dose of 30 ml/day, the drug exhibited anti-anxiety effects in 30 patients. Improved mental functions and relief in symptoms like nervousness, palpitation, insomnia, weakness, fatigue and dyspepsia were also observed. The immediate memory span in these patients was also increased[22]. The patients also showed a reduction in the level of plasma cortisol and urinary catecholamines[23].

A clinical study on 980 cases of thyrotoxicosis indicated that Shankapushphi (*C. pluricaulis)* in the dose of 125 mg BD has tranquilizing effects in addition to anti thyroid property. 90 – 93% improvement was observed in clinical features like weakness, palpitation, nervousness and appetite where as tachycardia tremours and easy fatifuability were found improved by 82.86%. This effect was almost similar to the standard antithyroid drug, Neomercazole with Diazepam (15 mg daily + 5 mg BD respectively). At the same time, the thyroid function tests showed a significant reduction in serum PBI levels in patients treated with Shankapushpi or in combination with standard drug as compared to standard drug alone[24]. In 25 cases of arterial hypertension, treated with the decoction of the drug (*C. pluricaulis),* a gradual fall in BP along with relief in the symptoms was observed.[9]

Koman (1919) did not find *E. alsinoides* efficacious in fevers attended with indigestion and diarrhoea[25].

Shankapushpi (drug source not mentioned) was investigated for its use as a pre-anaesthetic drug. 400 mg of the drug produced sedation in 48% of the cases (115 female patients) under study. The sedation was better than 60 mg luminal. Only 12% patients of the Shankapushpi group were apprehensive. Dizziness, a side effects of pre medicates and pain at the injection site were reduced by 50%. The drug also reduced the incidence of cough during induction period and prevented the post-operative nausea. The increase in cardiac rate exhibited by Shankapushpi was overcome by giving a mixture of equal amounts of Jalanimb (*Centella asiatica)* and Shankapushpi. No other side or toxic effects were observed. Sedation was also observed in healthy volunteers[26].

TABLE – 1

(1)	*Convolvulus Chois (Syn. C. microphyllus Sieb.)* (2)	*Evolvulus alsinoides L. (Syn. E. linifolius L.)* (3)	*Canscora decussate Roem. et. Schult (Syn. Pladera decussate Roxb)* (4)	*Clitoria ternatea (Syn. C. Philippensis Perr.)* (5)
FAMILY PARTS USED HABIT	Convolvulaceae Whole plant Prostrate herb with white or pink conch-like flowers	Convolvulacea Whole plant Prostrate herb with blue (rarely white) flowers	Gentianaceae Whole plant Erect herb with white flowers	Leguminosae Roots, seeds Twiner with blue or white flowers
FOUND IN PHARMACOPAEIAS	Ayurvedic Materia Medica (2)	India, Pakistan, Mexico, Phillippines, New Caledonia (27)	India, Pakistan, Vietnam (27)	Columbia, Guam, India, Indonesia, Laom, New Caledonia, Nepal, Nigeria, Pakistant, Phillippines, Vietnam (27)
THERAPEUTIC USES	Brain Tonic, mental diseases – epilepsy, insanity, nervousness (23)	Tonic, febrifuge, vermifuge, dysentery, chronic bronchitis, asthma (28) nervous debility syphilis, scrofula etc. alternative (29)	Laxative, nerve tonic alternative, insanity epilepsy, nervous debility (28)	Purgative, cathartic, diuretic, laxative, antidote, to snake poison (28), abortion (30).
CHEMICAL CONSTITUENTS	*Whole Plant* Shankapushpine (31) Essential Oil (31) Ceryl alcohol (32) β-Sitosterol (32)	*Whole Plant* Evolvin (18) Betaine (9) Pentatriacontane (33) Triacontane (33)	*Roots* Glycoalkaloid (34) Gentianine (34) Mangiferin (34) Triterpenes – β – amyrin	*Roots* Taraxerol (35) Taraxerone (36) Tannins & resins (19) *Leaves :*

	Scopoletin (32)	β-Sitosterol (33) Phenolic compounds (9) Tannins (9)	Friedelin, epifriedelanol Terpenic acids (34) Oxygenated xanthones (34)	Aparajitin (37) Kaempferol glycosides (38) β-Sitosterol (38) *Flowers:* Anthocyanins (39) *Seeds:* r-sitosterol (35) p-hydroxycinnamic acid (40) Tannic acid (19) Pentosan mucilage (41) Bitter acid resin (19)

Note : Figures in ( ) brackets denote references

Phytochemistry

Pharmacologically significant constituents from *C. pluricaulis* are a coumarin scopoletin and an alkaloid shankapushpine and that in *E. alsinoides* is the alkaloid evolvin. Mangiferin, xanthones, terpenes, gentianine (lactone) are characteristic of roots of *C. decussate.* Roots of *C.ternatea* contain terpenes, tannins and resins, where as seeds were found to contain tannic acid, bitter acid resin, pentosan and mucilage. The leaves of *C. ternatea* which are not used as drug contain kaempferol glycosides and aparajitin, a pentacosanoic acid lactone. The flowers of the plant were also found to contain anthocyanins. The detailed and comparative phytochemical analysis of these plants needs the attention of chemists.

Conclusion

(1) Four plants, viz. *C. pluricaulis, E. alsinoides, C. decussate* and *C. ternatea* are being used under the drug name "Shankapushpi".

(2) The plants exhibit significant CNS and cardiovascular activities.

(3) Comparative studies of the pharmacological activities and the chemical constituents of these plants will be very useful in explaining the use of the four plants as "Shankapushpi".

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