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## An updated review on Shankpushpi- As Medhya Rasayana

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### ABSTRACT

*Shankpushpi* is a plant and known as best brain tonic medicine which is classified under four *Medhya Rasayana* by *Acharya Charaka*. It is also included as main ingredient in many herbal extractives or decoction-based brain tonics or memory boosting formulations. Various *Ayurvedacharya* have named it as *manglayakusuma*, *ksheerpushpi*, *medhya* etc. *Shankpushpi* is also comes under convolvulacea family indicated as *Convolvulus pluricaulis*. The *Charaka Samhita*, which is an ancient book of Ayurveda described the use of paste (*kalka*) as *Medhya Rasayana*. There are so many experimental, pharmacological, clinical studies done on *Convolvulus pluricaulis* revealed the promising results as neuroprotective, memory enhancer, and antianxiety properties. The studies analysed its chemical composition like convolidine, convolvine, confoline etc. and may help to stimulate the brain activities. In addition, the studies have shown other properties like diuretic, antioxidant, hypolipidemic, hypotensive, antiulcer, antipyretic which helps to manage the various disorders. The various dosage forms like powder, paste, syrup is prepared by using whole plant or different parts of plant as indicated in classical texts. The present review study on *Shankpushpi* basically focused on the experimental or clinical studies done in the management of various ailments.

**Keywords:** *Shankpushpi*, *Convolvulus pluricaulis*, Neuroprotective, *Medhya*.

### INTRODUCTION

In Ayurveda, the medicines are being used in therapeutics with some explanatory logical manner and considering several drug-related and human constitution-based factors<sup>[1]</sup>. *Shankpushpi* is native and very noteworthy herb which claimed to enhance the functions of nervous system. The herb is used in traditional clinical practice by many *Ayurveda* practitioner as a single herb as well as in formulations due to its potential bioactive components<sup>[2,3]</sup>. Many *Ayurvedic* Physicians till date used it as natural tonic for mental development of children. In *Ayurveda*, the therapeutic properties of plants are basically explained on the basis of *rasa* (taste), *guna*, *viry*, *vipaka*, *karma* and is exhibits the *katu- kasya* in *rasa*, *guru*, *snigdha*, *sara*, *pischila* in *guna*, *ushana* in *viry*, *madhura* in *vipaka*, *medhakrita*, *swarakara*, *grahabhutadidoshhara* in *karma*<sup>[4]</sup>. The word *Medhakrita* means it promotes the intellectual activity, *sawrakara* means helps to improve the voice activity, *grahabhutadidoshhara* means helps to treat various mystic diseases, that is considered as viral or bacterial diseases<sup>[5]</sup>. Though, based on flower morphology and the nootropic potential, four plants, namely *Canscora decussata* Schult., *Clitorea ternatea* Linn., *Convolvulus pluricaulis* Choisy., and *Evolvulus alsinoides* Linn. are considered as *Shankpushpi* by Indian *Ayurvedic* practitioners, *Convolvulus pluricaulis* variety is mentioned as 'Shankpushpi' in *Ayurvedic Pharmacopea of India*<sup>[6]</sup>.

Aphrodisiac, laxative properties and helps to promote sound sleep also enhance the beauty of this herb. The extraction based research studies are done to treat the different conditions of brain like stress, Alzheimer, insanity; gastric ulcer etc. *Convolvulus pluricaulis* is also mentioned in the treatment of some diseased condition of brain in *Ayurveda* like *Unmada*, *Apsmara* in different formulations like powder, ghruta, oil etc<sup>[7]</sup>. According to ancient literatures, these *Medhya Rasayana* has been mentioned as life-promoting, help to treat various ailments, give strength to digestion system (*Agni*), complexion (*Varnya*), voice (*Swaraya*) and intellect-promoting (*Medhya*)<sup>[8]</sup>. It may have protruding action on Central Nervous System where they help to improve grasping power, memory, intellectual behaviour, speech, and mood personality disorders of an individual. Various researches claimed that it acts as molecular nutrient for brain activities to relieve mental fatigue, anxiety, stress etc.

*Shankpushpi* is proved its nontoxic properties as there are number of researches are done and published on various sites. It helps to balance the *tristambha* of body i.e. vitiated *kapha-vaat-pitta*. There are so many varieties are suggested on this plant and studies done on different varieties of shankpushpi have proved healing treatment in central nervous system disorders<sup>[7]</sup>, antianxiety<sup>[8]</sup>, antiemetic<sup>[9]</sup>. The various chemical constituents studied present in herb like alkaloids, flavonoids etc may be responsible for its

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biological actions in the managing the disorders [12]. It contains carbohydrate-D-glucose, maltose, rhamnose, sucrose, starch, proteins, amino acids and the alkaloids-convolvine, convolamine, phyllabine, convolidine, confoline, convoline, subhirsine, convosine, and

convolidine along with scopoline and FlavonsCoumarin, Beta-sitosterol, fatty acid and wax constituents, hydrocarbons, aliphatic and sterol[13-15].

## DISCUSSION

**Table 1:** Pharmacological activities of *Convolvulus pluricaulis* (Shankpushpi)

Part used	Experimental/ Clinical	Extract/ dosage form	Dose	Duration	Effect
Aerial	Mice	Aqueous Ethanol	500mg/kg	-	It is found that <i>Convolvulus pluricaulis</i> Choisy contains compound like shankpushpine and scopoletin, ceryl alcohol, the flavonoid kaempferol and the steroids phytosterol and $\beta$ -sitosterol, which act as GABA-A agonists could be attributed to the CNS depressant effect. It significantly showed reduced motor activity <sup>[16]</sup> .
Whole plant	Swiss albino mice	Dried powder	100mg/kg 200mg/kg	10 days	<i>Shankpushpi</i> was able to reduced alcoholic withdrawal anxiety, and also increased the cortical hippocampal GABA level <sup>[17]</sup> .
Whole Plant	Albino rats	Aqueous	200mg/kg	14 days	It was found effective in reducing Streptozocin induced toxicity (learning and memory deficit) in animal models also restoring biochemical enzymatic. It was helpful in improving cholinergic function, reduction of oxidative stress and enhancement of behaviour <sup>[18]</sup> .
Whole plant	Male Sprague Dwaley rats	Ethanol	100mg/kg, 200mg/kg, 400mg/kg	7 days	Mangiferin chemical constituent of <i>Canscoradecussata</i> enhances the recognition memory through that might be due to the involvement by increase in neurotropic and cytokine levels. It contains many xanthones may be responsible for synergistic effect <sup>[19]</sup> .
Whole plant	Laca mice	Aqueous Methanol	50mg/kg, 100mg/kg, 200mg/kg, 400mg/kg	30 days	It showed memory-enhancing, anxiolytic and CNS-depressant activity <sup>[20]</sup> .
			100mg/kg, 200mg/kg, 400mg/kg, 600mg/kg	30 days	
Roots	Albino rats	Aqueous	150mg/kg	3 months	It prevented aluminium induced neurotoxicity in the cerebral cortex, inhibiting oxidative stress and normalising the altered activity/levels of proteins at cholinergic synapse <sup>[21]</sup> .
Whole plant	Albino rats	Liquid (fresh juice)	375mg/kg to 750mg/kg	5 days	It showed the significant antiulcer activity, by increasing the rate of mucin secretion and total carbohydrate protein ratio, which is reliable marker of mucin secretion and enhancement of mucosal resistance factor <sup>[22]</sup> .
Whole plant	Albino rats	Aqueous Chloroform Alcoholic	150mg/kg 300mg/kg	10 days	Alcoholic, Chloroform and Aqueous extracts of <i>Convolvulus pluricalus</i> Choisy showed the protection of mitochondrial oxidative stress and also protecting the DNA from the fragmentation due to toxicity. It decreased the serum biochemical parameters and acted as hepatoprotective behaviour <sup>[23]</sup> .
Whole plant	Wistar rats	Dried powder	100mg/kg 400mg/kg	10 days	The result showed the significant antianxiety effect <sup>[24]</sup> .
Whole plant	Brain Cells	Standardised botanical extracts	12mg/ml	2hrs	It showed the significant elevation in cell survival, increased the level of reduced glutathione and neuroprotective efficacy <sup>[25]</sup> .

Whole plant	Albino rats	Aqueous	100mg/kg 150mg/kg 200mg/kg	30 days	It has been shown the significantly increases the scavenging activity of free radicals by its bioactive constituents which helps to attain antioxidant defence mechanism <sup>[26]</sup> .
Whole plant	Mice	Aqueous	100mg/kg 500mg/kg	14 days	It has significantly inhibited the effect of strychnine induced convulsions <sup>[27]</sup> .
Whole plant	Rats	Ethanol	400mg/kg 600mg/kg 800mg/kg	72 hours	It demonstrated the <i>Convolvulus pluricaulis</i> an antipyretic and anti-inflammatory action <sup>[28]</sup> .
Whole plant	Albino rats	Methanol	250mg/kg 500mg/kg 1000mg/kg	24 hours	It showed the moderate anticonvulsant and antioxidant property <sup>[29]</sup> .
Whole plant	Sprague Dawley rats	Methanol	50µg/ml 100µg/ml 150µg/ml 200µg/ml	15 days	<i>Evolvulusalsinoides</i> variety of <i>Shankpushpi</i> showed the positive markeable neuropharmacological effect as compare to other varieties of <i>Shankpushpi (Convolvulus pluricaulis)</i> <sup>[30]</sup> .
Whole plant	Wister rats	Methanol	400mg/kg	14 days	The study confirmed <i>Convolvulus pluricaulis</i> as a hypolipidemic agent <sup>[31]</sup> .
Whole plant	Wister rats	Aqueous	150mg/kg	4 weeks	<i>Convolvulus pluricaulis</i> showed the neuroprotective effect <sup>[32]</sup> .
Whole plant	Mice	Ethanol	25mg/kg 50mg/kg 100mg/kg	10 days	<i>Convolvulus pluricaulis</i> showed the antidepressant effect <sup>[33]</sup> .
Roots	Rats	Aqueous	100mg/kg 150mg/kg 250mg/kg	7 days	Aqueous extract of <i>Convolvulus pluricaulis</i> showed neuroprotective activity by scavenging reactive oxygen species <sup>[34]</sup> .

From table 1, effect of *Convolvulus pluricaulis* showed significant results in the management of different ailments.

#### Effect of CNS

The study on phytochemical profile of aerial parts of *Convolvulus pluricaulis* contained the tannins, triterpenoids, flavonoids, alkaloids, saponins glycosides and carbohydrates. Ethanol, aqueous, chloroform extracts showed the significant anxiolytic type of effect<sup>[16]</sup>.

The study done on three varieties of *Shankpushpi* showed different results. It is concluded that all three plants possess memory-enhancing, anxiolytic and CNS-depressant activity with *Convolvulus pluricaulis* showing the maximum activity. The reported results of memory-enhancing activity advise that *Convolvulus pluricaulis* should be used as the true source of *Shankpushpi*<sup>[20]</sup>.

The dried powder of *Shankpushpi* administered in anxiety induced animals, showed the significant anxiolytic behaviour<sup>[24]</sup>.

The aqueous extraction of roots also showed the neuroprotective properties by scavenging various reactive oxygen species<sup>[34]</sup>.

#### Antiaddictive Effect

From table 1, *Shankpushpi churan* (powder) was studied on alcoholic addictive mice for its antiaddictive behaviour. It showed the effective result on Cortico-hippocampal GABA levels and reported the antiaddictive potential<sup>[17]</sup>.

#### Effect on learning and memory

Study on Polyherbal Formulation, in which *Convolvulus pluricaulis* was content, on streptomycin induced memory impairment. The whole

observation was for 14 days which result the improvement in cholinergic behaviour, reduction in oxidative stress<sup>[18]</sup>.

The *Convolvulus pluricaulis* also known as cognitive booster, the study done on variety named *Canscora decussta*. The ethanolic extract of plant showed the significant result in Nerve Growth Factor, which could be the reason of boosting in cognition power<sup>[19]</sup>. In Indian tradition, *Shankpushpi* is a well-trusted natural remedy, and is used in children concomitantly with cow milk or honey for memory improvement<sup>[35]</sup>. These natural products act as an adjuvant as well as nutritional supplement for growing children<sup>[36]</sup>. Potentiated Bhavita dosage form of *Shankpushpi* may also be developed [by adopting classical guidelines of Bhavana (levigation/wet grinding)] and investigated for its bio-potential in memory enhancement<sup>[37,38]</sup>. Efforts should also be made to prepare green synthesized metallic nanoparticles by using *Shankpushpi* extract and its biological properties should be explored in various neurological disorders accordingly<sup>[39,40]</sup>, though the safety evaluation of newly developed dosage forms should be carefully observed<sup>[41,42]</sup>.

#### Neuroprotective effect

The neuroprotective study done on aluminium induced toxicity in brain of rats, in which aqueous extract of *Convolvulus pluricaulis* administered for 3 months. It indicated the prevention the neurotoxicity and reduced the oxidative stress. It showed the positive effect in altered activity of proteins on various level of cholinergic synapse<sup>[21]</sup>.

The study done of standardised extract of *Convolvulus pluricaulis* showed the neuroprotective effect by reduction in H<sub>2</sub>O<sub>2</sub> oxidative stress<sup>[25]</sup>.

The methanolic extract of four varieties of *Shankhpushpi* showed the antiemetic effect by inhibiting the 5-lipoxygenase which is responsible for the neurodegenerative disorders<sup>[30]</sup>.

The aqueous extract of plant also reported neuroprotective effect scopolamine induced stress<sup>[32]</sup>.

#### Antigastric & Antiulcer effect

The *Convolvulus pluricaulis* in the form of fresh juice was given for 5 days, reported the significant result in protecting gastric mucosa by the production of mucin<sup>[22]</sup>.

#### Hepatoprotective effect

The hepatoprotective effect of *Convolvulus pluricaulis* was studied on aqueous, alcoholic, chloroform extract. It is reported that serum biochemical parameters are decreased by extract treated animals<sup>[23]</sup>.

#### Antioxidant effect

The study done on aqueous extract *Convolvulus pluricaulis* showed significant antioxidant effect by scavenging the free radicals of stressed induced conditions that may be due to the presence of flavonoids, alkaloids and glycosides<sup>[26]</sup>.

Methanolic extract of *Convolvulus pluricaulis* reported the antioxidant effect by scavenging free radicals<sup>[34]</sup>.

#### Anticonvulsion effect

The anticonvulsant effect of *Convolvulus pluricaulis* was study on strychnine induced rats. The aqueous extract of plant acted as the co therapeutic agent in reduction of seizures<sup>[27]</sup>.

Another study done on methanolic extract of *Convolvulus pluricaulis* showed significantly reduction in the phase of convulsions<sup>[29]</sup>.

#### Anti-inflammatory and antipyretic effect

The ethanolic extract of *Convolvulus pluricaulis* showed the markable result as antipyretic and moderately anti-inflammatory effect<sup>[28]</sup>.

#### Effect on Lipid profile

The protective role of *Convolvulus pluricaulis* on lipid profile was studied on high fat induced animals. The aqueous extract was given for 14 days, resulted the hypolipidemic effect of plant<sup>[31]</sup>.

The study on silver nanoparticles by biosynthesis process using leaf extract of *Convolvulus Pluricaulis*. It was observed for their catalytic, electrocatalytic effect on different parameter scales. The result showed positive effect on electrocatalytic behaviour<sup>[43]</sup>.

To sum up, based on available evidences it is found that *Shankhpushpi* is a renowned Rasayana herb in Ayurveda with potent rejuvenating, immunomodulatory, cytoprotective, and antioxidant properties. Based on these bioactive attributes, the herb is mainly used by traditional practitioners as nootropic tonic and in wide range of neuropsychiatric or neurodegenerative disorders<sup>[44-50]</sup>.

## CONCLUSION

The above findings of various research articles revalidate pharmacological actions of the *Shankhpushpi* as medicine which was and till traditionally used by physicians. These data have given the marvellous approach that *Convolvulus pluricaulis* may be used to treat the various neurogenic conditions, stress induced conditions, memory enhancer, antigastric, antioxidant, hypolipidemic. Further studies and compiled data are required to validate the use of *Convolvulus pluricaulis* as a therapeutic agent in the management of various diseased conditions.

## Conflict of Interest

None declared.

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