

# Review on the Phytochemical and Neuro-Pharmacological Potential of *Convolvulus prostratus* Forssk (Convolvulaceae)

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## ABSTRACT

The therapeutic potential of *Convolvulus prostratus* Forssk (*C. prostratus*) has been valued in traditional medicine for years, and its immense pharmacological properties have recently been revealed. Phytochemicals such as Ayapanin, Scopoletin, Scopolin, Convolamine, Convolidine, etc., are present in *C. prostratus* and possess interesting medicinal properties, including memory enhancement and neuroprotective abilities. This article provides a brief overview of the biological activities of each phytochemical present in the plant, based on existing information in public databases. This review also delves into the diverse therapeutic potential of *C. prostratus*, especially related to neuropharmacological properties, by referencing existing preclinical *in vitro* and *in vivo* studies. This data not only provide the ground knowledge of the therapeutic potential of the plant but also reinforce the need for further preclinical and clinical studies to explore the full spectrum of the plant's medicinal activities.

**Keywords:** Convolvulaceae, Convolvulus, Neuropharmacology, Shankhpushpi.

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## INTRODUCTION

Neurological diseases are characterised by progressive dysfunction and death of neural cells and are associated with gliosis, protein misfolding, and aggregation. According to the Global Burden of Disease Study, neurological disorders have become a universal health concern. About 1.4% of all deaths and 28% of people with a disability were caused by these neurological disorders.<sup>[1]</sup> Genetic mutations, misfolded proteins, oxidative damage by free radicals, ageing, neuroinflammation, and many other factors can cause neurodegenerative diseases. Various Central Nervous System (CNS) drugs are available nowadays, which are highly valuable because of their specific physiological and psychological effects.<sup>[2]</sup> In the Indian traditional system of medicine, several herbal formulations claim to improve nervous functions and brain activity and have been used to treat neurological conditions like Alzheimer's disease, Epilepsy, Schizophrenia, etc.,<sup>[3]</sup> The therapeutic properties of these medicinal plants are due to their diverse secondary metabolites or phytochemicals responsible for the plants' organoleptic properties, such as aroma, colour, flavour, odour, and taste. Harsh environmental conditions and microbial or pest attacks drove the plants to produce more bioactive compounds with significant curative properties.<sup>[4]</sup>

*Convolvulus prostratus* (*C. prostratus*), Syn. *Convolvulus pluricaulis* Choisy, *Convolvulus microphyllus* Sieber ex. Spreng (Convolvulaceae), known as Shankhpushpi in Ayurveda, is a remarkable herb that enhances cognitive functions. It is a procumbent, prostrate, perennial herb with a woody stem and white-pale pink blooms (Figure 1).<sup>[5]</sup> Widely distributed in tropical and temperate regions, the plant is found in northwestern areas of India such as Gujarat, Punjab, Bihar, and Kashmir.<sup>[6]</sup>

According to the Ayurvedic Pharmacopoeia of India, Shankhpushpi mainly comprises the entire *C. prostratus* plant, a Convolvulaceae family member. Although *C. prostratus* is considered the Shankhpushpi plant, other plants like *Evolvulus alsinoides*, *Clitoria ternata*, and *Canscora deccussata* are also used in the name of Shankhpushpi in different regions of India.<sup>[7]</sup> This herb has immense pharmacological properties, so Ayurvedic practitioners use it frequently in traditional clinical practices. It is commercially quite exploitable as it is the source of some food additives, flavours, pharmaceuticals, and a necessary component of numerous well-known Ayurvedic mono or polyherbal medicines.<sup>[8]</sup> Despite its enduring therapeutic uses, scientific knowledge about its comprehensive phytochemical composition, pharmacological mechanisms, and ethnomedicinal applications remains incomplete. The increased global interest in plant-derived nootropic drugs necessitates an in-depth critical analysis of *C. prostratus* to summarise the existing insights and outline future research directions. This review article critically examines the detailed phytochemistry of *C. prostratus*, focusing on its bioactive compounds and their therapeutic activities. The study performed



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an intense search on databases like Scopus, Springer, PubMed, PubChem, Google Scholar, and Web of Science to review the phytochemicals present in the herb and their bioactive potential. This review also delves into the diverse therapeutic potential of *C. prostratus*, especially related to neuropharmacological properties.

### Chemical Composition of *C. prostratus*

*C. prostratus* is reported to have a wide variety of phytochemicals. It contains primary metabolites like Carbohydrates (rhamnose, D-glucose, maltose, sucrose, and starch), Proteins, Fatty acids (pentanoic acid, decanoic acid, myristic acid, linoleic acid, and palmitic acid), and Amino acids.<sup>[8,9]</sup> It has also been reported to have fatty alcohols (n-hexacosanol), volatile oils, and hydrocarbons (1-hexadecene, 1-octadecene, tridecane, eicosane, heneicosane, nonacosane). It is further characterised by the presence of glycosides, alkaloids (shankhpushpine, convolvamine, convolvine and convolidine), flavonoids (kaempferol, quercetin, chromanone, delphinidine), tannins, phenolic compounds (hydroxycinnamic acid and eugenol), terpenoids (taraxerol, taraxerone, squalane and lupeol), steroids, saponins, coumarins (scopoletin, scopolin, and ayapanin), resin, phytosterols (campesterol,  $\beta$ -sitosterol), and fixed oil as secondary metabolites (Figure 2).<sup>[10,11]</sup>

### Alkaloids

Alkaloids are nitrogen-containing secondary metabolites with low molecular weight and are one of the broadest categories of secondary plant metabolites. They are present in many plant families, including Convolvulaceae. These compounds are toxic against pathogens and herbivores and can act as defence compounds. Also, alkaloids can alter the CNS and have been known as psychopharmaceuticals since ancient times.<sup>[12]</sup> Convolvine, convolamine, convolidine, confolin, convosine and shankhpushpine have been identified from *C. prostratus* as alkaloids.<sup>[13-16]</sup> However, phyllabine, confolidine, convoline, and subhirsin can be present in the herb, as these were reported from other species.<sup>[17]</sup> The role of *C. prostratus* in curing CNS disorders, neuropharmacology, and memory enhancement is possibly due to these alkaloids. For instance, Convolamine, isolated from *C. prostratus*, positively modulates Sigma-1 receptors, ensuring the plant's cognitive and neuroprotective activity.<sup>[18]</sup> Similarly, Convolidine inhibits the enzyme BACE 1 (beta-site amyloid precursor protein cleaving enzyme 1), an important enzyme in the pathogenesis of Alzheimer's disease.<sup>[19]</sup> Furthermore, convolvine and its derivatives possess antihypoxic, immunostimulating, and anti-inflammatory activities.<sup>[20]</sup> Notably, the Shankhpushpine is a chemotaxonomic marker for *C. prostratus*.<sup>[15]</sup>

### Coumarins

Coumarins are a class of phenols belonging to the family of benzopyrones that exhibit diverse pharmacological activities.

Natural coumarins are known for their wide spectrum of biological activities, including anti-inflammatory, anticancer, antimicrobial, antioxidant, anticonvulsant, neuroprotective, and anti-Alzheimer's activities.<sup>[21,22]</sup> Among the coumarins reported from the plant *C. prostratus*, scopoletin and scopolin are particularly noteworthy.<sup>[23]</sup> Scopoletin, a bioactive marker in *C. prostratus*, possesses memory-enhancing, anti-depressive, anxiolytic, antioxidant, and neuroprotective properties.<sup>[24,25]</sup> Likewise, scopolin, the glucoside of scopoletin, is well known for its anti-inflammatory and antiangiogenic activities.<sup>[26]</sup> Both scopoletin and scopolin are reported to have anti-amnesic effects (scopolamine-induced amnesia) and acetylcholinesterase inhibitory activity.<sup>[23]</sup> Additionally, ayapanin, a 7-methoxy coumarin reported from the plant, alleviates neuropathic pain and exhibits anti-inflammatory, hepatoprotective, and antioxidant effects.<sup>[27,28]</sup>

### Flavonoids

Flavonoids are the largest group of phenolic secondary metabolites. Flavonoids can be classified into various groups, including flavones, flavonols, flavanones, isoflavonoids, neoflavonoids, catechins, anthocyanins, and chalcones.<sup>[29]</sup> Kaempferol and quercetin, well-known flavanols, are present in *C. prostratus*.<sup>[10]</sup> They are the most studied flavonoids due to their strong antioxidant properties and their notable role in the plant defence system. Moreover, they have a high therapeutic potential for human health. Both have anti-bacterial, anti-cancerous, anti-adipogenic, and antiviral properties and specifically, quercetin can be used to treat allergies, metabolic and inflammatory diseases, cardiovascular diseases, etc.,<sup>[30-32]</sup> Delphinidin, an anthocyanin, is also reported from *C. prostratus*. It has anticancerous, anti-inflammatory, neuroprotective, antidiabetic and antioxidant activities.<sup>[33,34]</sup> Furthermore, chromanone, a benzopyranone compound, is also reported from this plant.<sup>[35]</sup>

### Phenolic compounds

Phenolic compounds are widespread secondary metabolites ubiquitously present in most plant families that are potent antioxidants.<sup>[36]</sup> Free radicals and other Reactive Oxygen Species (ROS) can cause various harmful effects in the human body, such as diabetes, cardiovascular disease, inflammation, neurodegenerative diseases, and even cancer. Antioxidants have a substantial role in preventing these detrimental effects of oxidative stress.<sup>[37]</sup> The *C. prostratus* contains natural phenols like hydroxycinnamic acid and eugenol, and alkylated phenols like 2,4-bis (1,1-dimethyl ethyl)-phenol.<sup>[10,34]</sup> Hydroxycinnamic acid has a phenolic hydroxyl group, which can react with free radicals and other ROS species and exert strong antioxidant properties. It also has antimicrobial, anti-inflammatory, neuroprotective, and anticancerous activity.<sup>[37]</sup> Additionally, mangiferin, a xanthone, was also reported to be from this plant.<sup>[24]</sup>

## Phytosterols

Phytosterols are plant-derived steroids found in the unsaponifiable matter of plant lipids. These phytosterols may possess chemopreventive, antioxidant, anti-inflammatory, antidiabetic, antiatherosclerotic, and cardioprotective properties.<sup>[38]</sup> *C. prostratus* contains campesterol, vitamin E precursors (trans-phytol and isophytol), and  $\beta$ -sitosterol as its phytosterols. Among them,  $\beta$ -sitosterol is the most abundant.<sup>[33]</sup>  $\beta$ -sitosterol is a major phytosterol in many plants and has various biological properties, including anxiolytic and sedative effects, antimicrobial, anticancerous, immunomodulatory, anti-inflammatory, analgesic, and hepatoprotective effects.<sup>[39]</sup> Campesterol acts against rheumatoid arthritis and has angiogenic and anticarcinogenic effects.<sup>[40,41]</sup>

## Terpenoids

Terpenoids are one of the largest, structurally diverse groups of secondary metabolites. *C. prostratus* contains pentacyclic triterpenoids such as lupeol, taraxerol, and taraxerone, as secondary metabolites.<sup>[10,33]</sup> They are reported to have anticancerous, anti-inflammatory, antioxidant and antimicrobial activities.<sup>[42-44]</sup> Specifically, lupeol has antiprotozoal activity.<sup>[42]</sup>

The identified phytochemicals and their bioactive potential are summarised in Table 1.

## NEURO-PHARMACOLOGICAL ACTIVITIES

### Nootropic activity

*C. prostratus* is a promising cognitive enhancer that significantly enhances memory. It has been evaluated through various behavioural paradigms that impose different aspects of learning and memory. The Cooke and Weidley's pole apparatus and shuttle box active avoidance model primarily assess motor learning and conditioned responses, whereas the passive avoidance test (step down latency) examines fear-motivated memory

retention. Memory retention by *C. prostratus* is evident and is dose-dependent, as proven by the increased avoidance responses in Cooke and Weidley's pole apparatus, increased step-down latency in the step-down test, and significant reduction in transfer latency in the EPM model with increased doses. Hence, the herb improves spatial and fear-motivated memory.<sup>[45,46]</sup> Additionally, it can protect against scopolamine-induced learning and memory impairment and amnesia.<sup>[47]</sup> Scopolin and Scopoletin, major coumarins present in the herb, are reported to be responsible for the activity against scopolamine-induced memory impairment by modulating the cholinergic system.<sup>[23]</sup> *C. prostratus* also enhances memory by modulating hippocampal plasticity, improving Long-Term Potentiation (LTP), and reducing Long-Term Depression (LTD) tested by Cortical Fear Conditioning (CFC) and Novel Object Recognition Test (NORT).<sup>[48]</sup>

*In silico* studies of *C. prostratus* reported its potential activity against neurodegenerative diseases through network pharmacology and molecular docking analysis. The major bioactive compounds identified in *C. prostratus* - convolamine, convoline, scopoletin and convolvine exhibited strong interaction with GSK3 $\beta$ , which is a known target for Alzheimer's disease.<sup>[49]</sup> In another study, scopoletin showed a high affinity towards TrkB, a critical drug target for dementia.<sup>[50]</sup> These results suggest the plant's potential as a nootropic herb, which warrants further preclinical and clinical investigations.

### Anxiolytic activity

Anxiety is a heterogeneous psychiatric ailment represented by fear and phobias.<sup>[51]</sup> *C. prostratus* is a potent medicinal plant with anxiety-reducing properties (Figure 3). It shows a notable increase in open space exploration in the Elevated Plus Maze model, indicating anxiety-reducing activity.<sup>[52]</sup> The ethanol, ethyl acetate, methanol, and chloroform extracts significantly show anxiolytic activity in a dose-dependent manner.<sup>[7,46,51,52]</sup> Among them, the ethyl acetate fraction is the most potent one.<sup>[7]</sup> Even though the



Figure 1: *Convolvulus prostrates*.

activity is dose-dependent, a slight decline was observed at higher doses. This could be due to the sedative effect of *C. prostratus*, as it significantly decreases locomotor activity, suggesting its CNS depressant or soothing effect.<sup>[53]</sup> The aqueous extracts do not show any significant activity and indicate the absence of active anxiolytic compounds in aqueous extracts.<sup>[7]</sup>

### Antidepressant activity

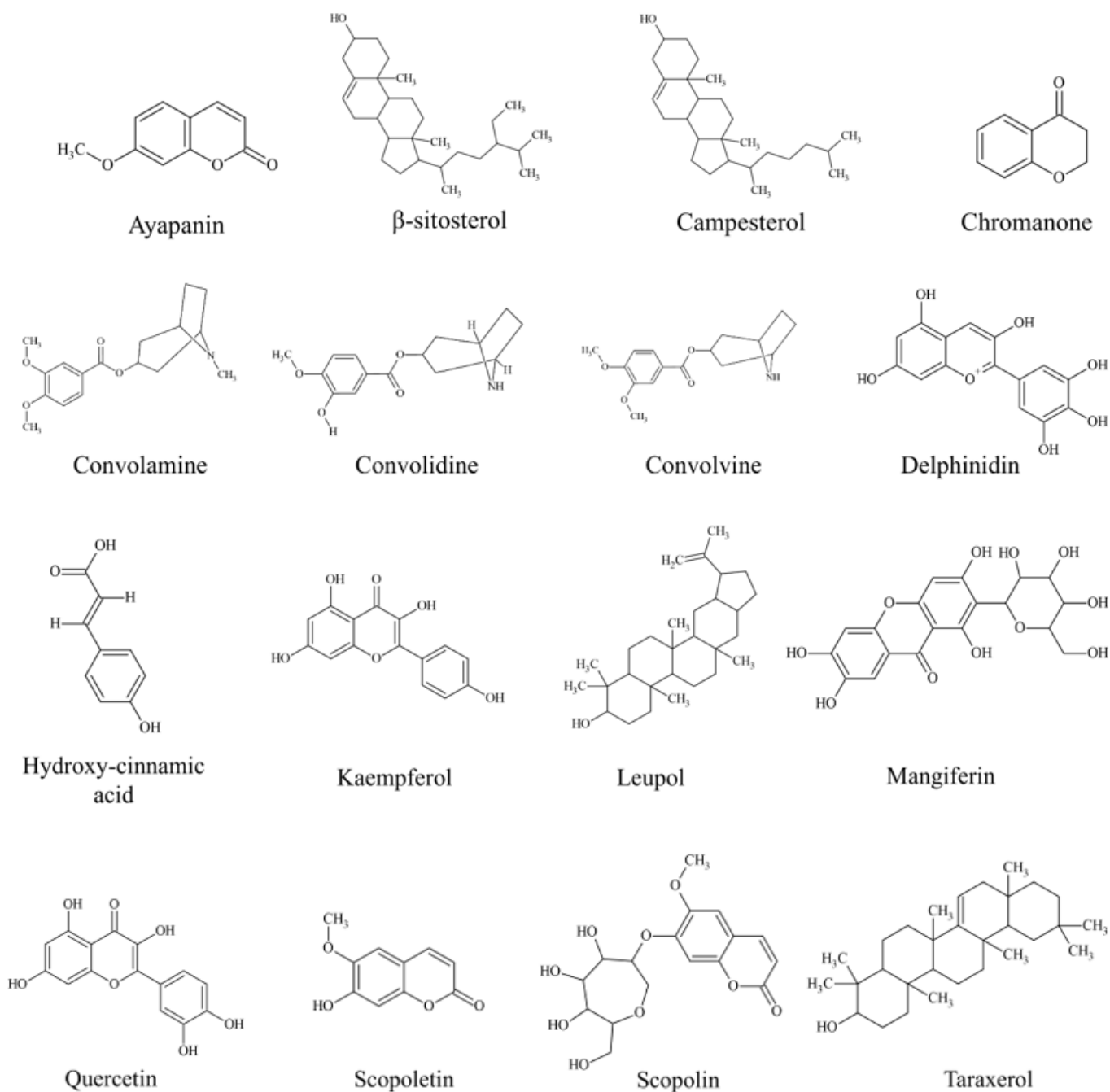
The chloroform fraction of an ethanolic extract of *C. prostratus* at a higher dose shows significant antidepressant-like activity in the Forced Swim Test and Tail Suspension Test.<sup>[54]</sup> While the extract decreased the immobility period and reversed the reserpine-induced prolongation of the immobility period, which denotes antidepressant activity, it did not influence the locomotor activity, specifying that antidepressant-like activity is not due to general motor stimulation.<sup>[46,54]</sup>

### CNS depressant activity

The *C. prostratus* has dose-dependent CNS depressant activity (Figure 3). At higher doses, *C. prostratus* extract remarkably reduces locomotor activity.<sup>[46]</sup> The ethanolic and aqueous extract has an antagonistic effect against amphetamine-induced locomotor activity.<sup>[53]</sup> Also, the herb significantly affects rodent behaviour, marked by inhibition of exploratory activity (head dip and Y maze tests) and electroshock-induced fighting behaviour.<sup>[55]</sup> This may indicate the CNS depressant or anxiolytic properties of the herb *C. prostratus*. Likewise, the ethanolic extract of *C. prostratus* showed a significant reduction in neuromuscular coordination, indicating muscle relaxant activity.<sup>[7]</sup> In contrast, the chloroform extract does not impair locomotor activity at higher doses.<sup>[56]</sup> The probable molecular mechanism for this property may be GABA agonism, where the chemicals in the

**Table 1: Biological activities of phytochemicals present in *C. prostratus*.**<sup>[18-20,23-28,30-35,37,39-44]</sup>

Class	Chemical name	Pharmacological activity
Alkaloids	Convolamine	Memory-enhancing and neuroprotective activity.
	Convalidine	Memory enhancement.
	Convolvine	Anti-hypoxic, immune-modulatory, anti-inflammatory activity.
Anthocyanin	Delphinidin	Anticancerous, anti-inflammatory, neuroprotective, antidiabetic and antioxidant activities.
Benzopyranone	Chromanone	Insecticidal activity, antifungal activity, and antibacterial activity.
Phenolic acids	Hydroxy-cinnamic acid	Antioxidant activities, anti-inflammatory activity, neuroprotective activities, antimicrobial activity, anticancerous activity.
Coumarin	Ayapanin	Anti-nociceptive (reduces pain) activity, reduces neuropathic pain, anti-inflammatory activity, hepatoprotective, and anti-oxidant effects.
	Scopoletin	Anti-microbial, anti-cancer, anti-inflammation, anti-angiogenesis, anti-oxidation, antidiabetic, anti-hypertensive, protective, and neuroprotective activities.
	Scopolin	Anti-inflammatory activity, anti-angiogenic activity.
Flavonoids	Kaempferol	Antibacterial activity, antifungal activity, antiprotozoal activity, anti-inflammatory and antidiabetic activity.
	Quercetin	Antioxidant activity, antiviral, antimicrobial, antiprotozoal, anti-inflammatory activity, anticancer activity, hepatoprotective activity.
Phytosterol	$\beta$ -sitosterol	Anti-inflammatory activity, antipyretic (reduce fever) activity, anti-inflammatory activity, anti-cancerous activity, anti-depressant-like effects.
	Campesterol	Act against rheumatoid arthritis, angiogenic and anticarcinogenic effects.
Terpenoids	Leupol	Antiprotozoal activity, antitumor activity, hepatoprotective, antimicrobial activity.
	Taraxerol	Antioxidant activity, antimicrobial activity, antidiabetic and anti-inflammatory activity.
	Taraxerone	Anticancerous and antipulmonary fibrosis effect.



**Figure 2:** Chemical structures of significant phytochemicals present in *C. prostratusprostrates*.

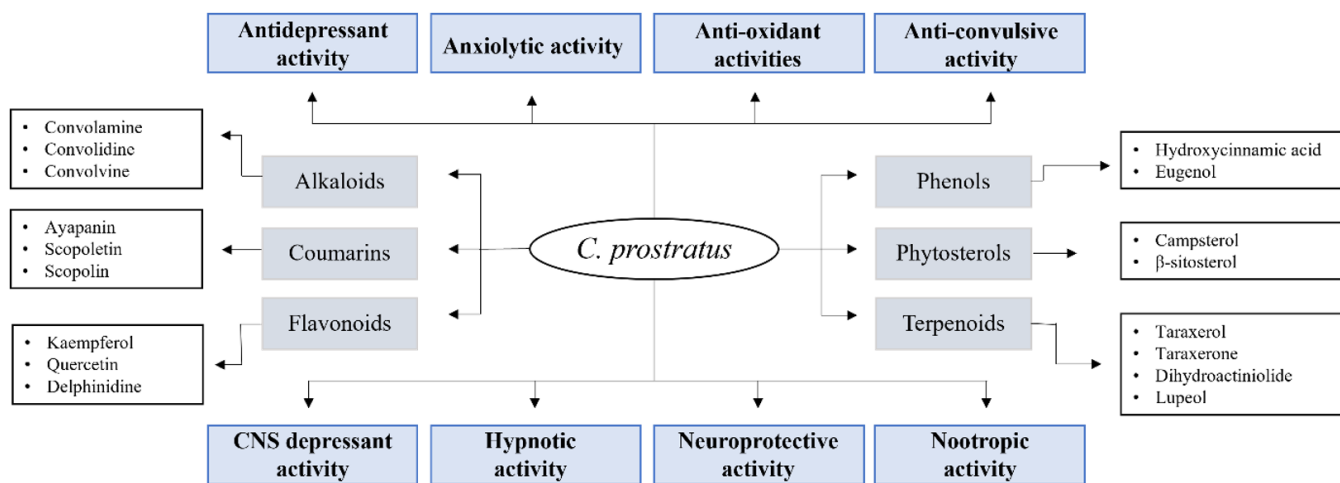
plant can influence the GABA pathway. Drugs will enhance GABA activity and help reduce anxiety.<sup>[52]</sup>

### Hypnotic activity

*C. prostratus* can also act as a potent hypnotic agent and significantly induce sleep in albino mice. Testing the pentobarbitone-induced sleeping time or the Thiopental Sodium-induced sleeping time gives a sensitive way to assess an extract's hypnotic or soothing effect. The plant can potentiate sleeping time in adult Swiss albino mice induced by thiopental sodium and pentobarbitone.<sup>[53,55]</sup>

### Anti-convulsive activity

Epilepsy is a serious brain disorder that is often associated with convulsive seizures. Anticonvulsants can prevent seizures in experimental animals.<sup>[56]</sup> Aqueous, ethanolic, and chloroform extracts of *C. prostratus* can significantly protect against PTZ (pentylentetrazole)-induced clonic convulsions.<sup>[3]</sup> Aqueous extract can act as a co-therapeutic agent of phenytoin sodium for preventing seizures induced by strychnine and PTZ.<sup>[57,58]</sup> Inversely, methanolic extract failed to protect against experimentally induced seizures in PTZ, strychnine, and MES models.<sup>[55]</sup> In the MES model, the extract has a partial activity,



**Figure 3:** The significant phytochemicals and therapeutic properties of *C. prostratus*.

where it failed to prevent hind limb tonic extension, but it shortened the recovery time from convulsions.<sup>[59]</sup> This disparity indicates that the methanol extract lacks the full spectrum of anticonvulsant phytochemicals, possibly due to the insolubility of the phytochemicals or their destruction during the extraction process. Coumarins and Triterpenoids in the herb might explain the herb's anticonvulsant properties.<sup>[60]</sup> Even though methanol can extract various polar phytochemicals, including coumarins and terpenoids, the relatively weaker activity of the methanol extract could be due to the lower concentrations or significant synergistic components better extracted by other solvents are missing.

### Anti-oxidant activity

Free radicals can cause oxidative damage in brain cells, which may be the major reason for developing some neurodegenerative diseases. Antioxidants can neutralise these free radicals and ROS and inhibit oxidative stress.<sup>[61]</sup> The ethyl acetate and aqueous fractions of the total ethanolic extract of *C. prostratus* have strong antioxidant activities (Figure 3) by scavenging the superoxide radicals.<sup>[7]</sup> Also, the aqueous extract effectively restored the oxidative stress and neural damage caused by scopolamine.<sup>[47]</sup> Specifically, the phenols, flavonoids, and vitamin E in *C. prostratus* can act as ROS scavengers and exhibit strong antioxidant activities. The plant shows strong anti-oxidant properties by restoring and regulating SOD (Superoxide Dismutase) and CAT (Catalase) which are anti-oxidant markers. It can also neutralise the free radicals and inhibit the reactive oxygen species and mitochondrial membrane depolarisation. The extract can also help the SH-SY5Y cells survive under H<sub>2</sub>O<sub>2</sub> exposure for 24 hr, showing their strong antioxidant activity.<sup>[11]</sup>

### Neuroprotective activity

The aqueous root extract of *C. prostratus* relieves aluminium, scopolamine, and tau (hMAP $\tau$ ) induced neurotoxicity.<sup>[47,62]</sup> Aluminium, in excess amounts, disrupts biological processes like

Na<sup>+</sup>/K<sup>+</sup> ATPase activity, increases acetylcholine esterase activity, changes the level of endogenous antioxidant enzymes, and damages some lipids and proteins. The plant extract can maintain the Na<sup>+</sup>/K<sup>+</sup> ATPase activity, balance the associated levels of endogenous antioxidant enzymes, and prevent lipid and protein damage.<sup>[60]</sup> The herb effectively reduces the acetylcholine esterase activity. It substantially improves the hMAP $\tau$ -induced locomotor deficits and prevents hMAP $\tau$ -induced early death, extending the life span of diseased (Alzheimer's) *Drosophila* flies.<sup>[63]</sup>

### OTHER BIOLOGICAL ACTIVITIES

Apart from these neurology-related therapeutic properties, *C. prostratus* is reportedly associated with anti-diabetic, anti-ulcer, anti-diarrheal, anti-obesity, cholesterol-lowering, hypotensive, thyroid-regulating, hepatoprotective, spasmolytic, anti-inflammatory, and insecticidal activities (Table 2).

### ETHNOMEDICINAL ACTIVITIES

In India, plants have an important role in socioeconomic and socioreligious aspects.<sup>[17]</sup> In Ayurveda, *C. prostratus* is considered a Medhya Rasayana, which enhances learning and memory and is used in many formulations for nerve disorders. It also has many ethnomedicinal uses in various tribes across India. Ancient Indian medical practitioner Acharya Charaka used *C. prostratus* along with other herbs such as *Bacopa monnieri*, *Acorus calamus*, and *Saussurea lappa* for treating epilepsy and insomnia.<sup>[10]</sup> The whole plant juice prevents excessive menstruation.<sup>[17]</sup> In the folklore plains of Uttar Pradesh, the *C. prostratus* powder in milk is used as an aphrodisiac.<sup>[70]</sup> The leaves are used for mental illness in Gonda, Uttar Pradesh.<sup>[8]</sup> Among Rajasthan tribals, a mixture of *Evolvulus alsinoides* and *Convolvulus prostratus* in sugar is employed to cure leucorrhoea.<sup>[71]</sup> In Jammu and Kashmir, the folklore uses the leaves of *C. prostratus* as a spinach substitute to treat intestinal worms. Also, it has purgative properties and is used against constipation.<sup>[72]</sup> The tribals in Chindwara, Madhya

**Table 2: Other biological activities in *C. prostratus*.**<sup>[13,64-69]</sup>

Biological activities	Possible mechanism of action
Antiulcer activity	Increases the production of mucin and mucosal glycoproteins, and the life span of mucosal cells.
Hypolipidemic and anti-obesity activity	Reduces total cholesterol levels, LDL-cholesterol, Triglycerides (TG), and VLDL-cholesterol but increases HDL-cholesterol.
Hepatoprotective activity	Protect the liver against thioacetamide-induced hepatotoxicity.
Anti-thyroid activity	Controls hyperthyroidism in female rats by inhibiting 5' monodeiodinase - enzyme activity.
Anti-hyperglycemic activity	Decreases blood glucose levels in normal as well as streptozocin-induced diabetic rats.
analgesic activity	Reduces pain
Anti-inflammatory	Inhibits or reduces paw oedema in the carrageenan-induced rat paw oedema model.
Anti-platelet effect	Inhibits the platelet aggregation induced by ADP and 12-DOP.
Insecticidal activities	A new compound, db 29oxodotriacontanol, inhibits the growth of an insect named <i>Spilosoma obliqua</i> Walker.

Pradesh, consider the herb anthelmintic, good for treating dysentery, skin disorders, and high blood pressure.<sup>[8]</sup>

## CONCLUSION

Shankpushpi is a memory-enhancing herbal drug that balances Kapha-Vata-Pitta in the Human body. Investigations on each source of Shankpushpi (*Convolvulus prostratus*, *Evolvulus alsinoides*, *Canscora deccussata*, and *Clitoria ternata*) exhibited their ability to cure neurological disorders. Preclinical *in vitro* and *in vivo* assessments actively support the traditional use of *C. prostratus*, an extremely versatile plant for memory enhancement. Similarly, various *in vivo* studies with mice as model organisms validate the different ethnomedicinal uses of *C. prostratus*. The efficacy of *C. prostratus* in mitigating neurodegenerative diseases is likely due to the major phytochemicals present in the plant, such as Convalidine, Scopoletin, Ayapanin, etc. However, further clinical studies are vital for establishing the herb as a commercial drug, as the data are lacking now. Some preliminaries *in silico* studies provide a basis for further clinical studies. In conclusion, rich phytochemicals have a substantial role in the medicinal activity of the herb. Further, in-depth studies are needed to

elucidate the mechanism of action, effectiveness, and safety of the various medical properties of the herb.

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## ABBREVIATIONS

**CNS:** Central Nervous System; **BACE 1:** beta-site amyloid precursor protein cleaving enzyme 1; **EPM:** Elevated Plus Maze; **LTP:** Long Term Potentiation; **LTD:** Long term Depression; **NORT:** Novel Object Recognition Test; **CFC:** Cortical Fear conditioning; **ROS:** Reactive Oxygen Species; **GABA:** Gamma-Aminobutyric Acid; **PTZ:** pentylenetetrazole; **SOD:** Superoxide Dismutase; **CAT:** Catalase; **LDL:** Low Density Lipoprotein; **TG:** Triglycerides; **VLDL:** Very Low Density Lipoprotein; **HDL:** High Density Lipoprotein; **ADP:** adenosine diphosphate; **12 DOP:** 12-deoxyphorbol phenylacetate.

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## CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

## SUMMARY

This review investigated the phytochemical diversity and medicinal properties of *Convolvulus prostratus* Forssk. (*C. prostratus*) *C. prostratus* possesses immense therapeutic properties, including antioxidant, anti-inflammatory, anticancer, antiadipogenic, antihyperglycemic, cardioprotective, and chemopreventive activities. It has a calming effect on the CNS and can be used against epilepsy, anxiety, depression, stress, hypertension, etc., hence it has a significant role in the context of neurological and emotional well-being. The review emphasises the major phytochemicals identified in the herb with their significant therapeutic properties. The analysis of existing literature revealed the presence of alkaloids, coumarins, flavonoids, phenols, terpenoids, phytosterols, glycosides, tannins, etc. in the herb, which have been linked to cognitive enhancement.

## AUTHOR'S CONTRIBUTIONS

All authors contributed to the conception and design. Kavya Vishnu carried out the literature search, data acquisition, data analysis, and prepared the first draft. Kochuthressia KP and Sinjumol Thomas reviewed and edited the final draft. All authors approved the final version of the manuscript.

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