# Journal of Medical and Scientific Research

Cheekavolu C et al. J Med Sci Res. 2025; 13(2):223-228 DOI: http://dx.doi.org/10.17727/JMSR.2024/13-39



REVIEW OPEN ACCESS 3

# A systematic review of the phytochemical profile and medicinal significance of *Evolvulus alsinoides*

Chakrapani Cheekavolu<sup>1</sup>, Nithya Karnam<sup>2\*</sup>, Naiyma Choudhary<sup>3</sup>, Sangeeta BSR<sup>4</sup> and Rishitha Chowdary Mavillapalli<sup>5</sup>

- <sup>1</sup>Department of Pharmacology, Karpagam Faculty of Medical Science and Research, Ottakalmandapam, Coimbatore, Tamil Nadu 641032, India <sup>2</sup>Department of Pharmacology, Sri Venkateswaraa Medical College & Hospital, Sri Venkateswaraa University, Red Hills, Chennai, Tamil Nadu 600067, India
- <sup>3</sup>Department of Pharmacology, MVJ Medical College and Research Hospital, Bangalore 562114, Karnataka, India
- <sup>4</sup>Department of Medical Surgical Nursing, Symbiosis College of Nursing, Faculty of Nursing, Symbiosis International University, Lavale, Pune
- <sup>5</sup>Department of Pharmacognosy, Faculty of Pharmacy, Sri Ramachandra University, Chennai, Tamil Nadu 600116, India

#### **Abstract**

**Background:** The perennial herb *Evolvulus alsinoides L.*, sometimes called "Vishnukranthi" or "Shankhpushpi," belongs to the Convolvulaceae family. Traditional medicine utilises the entire plant and its various parts to treat multiple ailments, including stomach ulcers. This review aimed to analyse the phytochemical constituents of extracts of *E. alsinoides* and highlights its medicinal importance.

**Methods:** This systematic review was conducted using search strings such as "Shankhpushpi" and "Evolvulus alsinoides Linn," with data extracted from experimental studies published between June 2019 and 2024 across PubMed, medRxiv, Scopus, and Google Scholar databases.

**Results:** In this study, a total of 174 articles were generated from the search string, and two authors were involved in screening the articles as per inclusion and exclusion criteria. Finally, 25 articles were included and 149 articles were excluded. The phytochemical constituents of different extraction methods and medicinal properties were discussed in this review.

**Conclusion:** *E. alsinoides* exhibits nootropic, anxiolytic, and memory-enhancing effects, supports respiratory and neurological health, and shows immunomodulatory and hepatoprotective properties, validating its traditional use as a potent therapeutic herb for multiple ailments.

**Keywords:** *Evolvulus alsinoides;* medicinal uses; pharmacological properties; phytochemical analysis; methanolic extract; bioactive compounds

#### Introduction

Evolvulus alsinoides Linn., (E. alsinoides) commonly known as "Shankhpushpi," is a prostrate, perennial herb belonging to the family Convolvulaceae. It is widely distributed in tropical and subtropical regions, including India, Sri Lanka, and Southeast Asia, growing in dry, rocky areas and grasslands [1]. The herb is highly known to be used in Ayurveda, Unani, and traditional medicine systems for its cognitive-enhancing and neuroprotective properties. The plant exhibits a wide range of pharmacological activities, including nootropic, adaptogenic, anxiolytic, antidepressant, and antioxidant effects [2]. Research efforts worldwide are increasing to find new and natural sources of antioxidants. E. alsinoides possessed rich secondary metabolite compositions, as

well as therapeutic and medical properties, [2] yet it has limited research. The present review aimed to perform

\*Corresponding author: Dr. Karnam Nithya, Associate professor, Department of Pharmacology, Sri Venkateswaraa Medical College & Hospital, Sri Venkateswaraa University, Red Hills, Chennai, Tamil Nadu 600067, India. Email: nithyasree13@gmail.com

Received 5 December 2024; Revised 4 March 2025; Accepted 11 March 2025; Published 19 March 2025

**Citation:** Cheekavolu C, Karnam N, Choudhary N, Sangeeta BSR, Mavillapalli RC. A systematic review of the phytochemical profile and medicinal significance of *Evolvulus alsinoides*. J Med Sci Res. 2025; 13(2):223-228. DOI: http://dx.doi.org/10.17727/JMSR.2024/13-39

**Copyright:** © 2025 Cheekavolu C et al. Published by KIMS Foundation and Research Center. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

a systematic analysis of experimental studies with phytochemical composition, extraction methods and medicinal properties in *E. alsinoides* Linn. This may be helpful for further research to bring these valuable plant extracts into formulations and clinical indications.

#### Methods

This systematic review was conducted using search strings such as "Shankhpushpi" and "Evolvulus alsinoides Linn," with data extracted from experimental studies published between June 2019 and 2024 across PubMed, medRxiv, Scopus, and Google Scholar databases. The generated search results were screened by two authors independently as per inclusion and exclusion criteria. This systematic review strictly adhered to PRISMA guidelines for reporting systematic reviews and Metanalyses.

*Inclusion criteria:* Experimental and clinical studies with phytochemical analysis and medicinal properties of the study plant published during the last 10 years were included in this study.

*Exclusion criteria:* Review articles including systematic reviews, meta-analysis studies, articles not related to the study plant extract or as per inclusion criteria.

#### **Results**

In this study, a total of 174 articles were generated from the search string, two authors were involved in screening the articles as per inclusion and exclusion criteria. Finally, 25 articles were included and 149 articles were excluded as they didn't contain the information related to both extraction and medicinal properties of the extract (Figure 1). The phytochemical constitution, extraction method and medicinal properties are tabulated in Table 1.

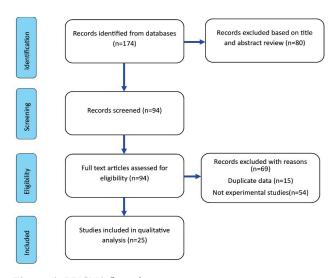


Figure 1: PRISMA flow chart.

## **Medicinal importance**

E. alsinoides is traditionally used to manage disorders such as anxiety, epilepsy, dementia, and mental fatigue. Modern research supports its potential to protect against neurodegenerative diseases, including Alzheimer's disease, due to its anti-inflammatory and neuroprotective effects [14]. The herb is also reported to have antimicrobial, hepatoprotective, and immunomodulatory activities, broadening its therapeutic applications. Its safety profile has been highlighted in various studies, showing minimal toxicity and suitability for long-term use in therapeutic formulations [15]. E. alsinoides remains a promising natural resource for the development of herbal medicines and neuroprotective agents. Traditional medicine has long acknowledged the medicinal potential of the plant E. alsinoides. Medicinal plants have been a cornerstone of traditional medicine systems worldwide. Among them, E. alsinoides (Convolvulaceae), commonly known as Shankhpushpi in Ayurveda, has been extensively used for its nootropic, anxiolytic, and antiinflammatory properties [16]. The purpose of this work is to examine the phytochemical makeup of methanolic extracts of *E. alsinoides* leaves [17]. Numerous bioactive chemicals with possible pharmacological qualities were found during the investigation, confirming the plant's traditional applications. This plant is known for its medicinal properties, often attributed to secondary metabolites like alkaloids, flavonoids, tannins, saponins, carbohydrates, phenols, and glycosides [18]. While its therapeutic efficacy is well-documented, the precise phytochemical constituents responsible for these effects remain inadequately explored.

*E. alsinoides* has been traditionally used in East Asian medicine for its potential psychotropic and nootropic effects, though these claims lack medical validation. Several chemical compounds have been identified in *E. alsinoides*, including scopoletin, umbelliferone, scopolin, and 2-methyl-1,2,3,4-butanetetrol [19].

## Therapeutic applications

### Cognitive enhancement and neuroprotection

Two doses (100 and 200 mg/kg P.o.) of the ethanol extract and ethyl acetate and aqueous fractions were given to different animal groups. Both doses of all the extracts of EA significantly improved learning and memory in rats, and they also significantly reversed the amnesia caused by scopolamine (0.3 mg/kg i.p.). EA also showed strong memory-enhancing effects in the stepdown and shuttle-box advance paradigms. Nootropic activity was compared using piracetam as the standard [20].

**Table 1:** Evolvulus alsinoides L Phytochemical composition of different extracts and their medicinal properties.

Place of study, Year and Reference No.	Study type	Extraction	Phytochemical constituents	Property
Karaikudi, India, 2024 [3]	In vitro	Exogenous carbon quantum dot (CD) application on hairy root cultures	Squalene, stigmasterol, hydrogen peroxide and malondialdehyde	antioxidant enzyme activity.
Tamil Nadu, India, 2024 [4]		Leaf aqueous extract	Phenolics, terpenoids, steroids, and tannins	antidiabetic activity: inhibition of alpha-amylase and alpha- glucosidase.
Uttar Pradesh, India, 2024 [5]	Human	Dried hydro- alcoholic extract	NA	Antihypertensive property
Maharashtra, India, 2024 [6]	In vitro	Aqueous extract of EA	Scopoletin, saponins, tannins, glycosides, proteins, and coumarins	Antioxidant activity
Tamil Nadu, India, 2023 [7]	In vitro	Methanolic extract	Tetra acetyl-d-xylonic nitrate, Bicyclo [5.2.0] nonane 2methylene 4,8,8trimethyl-4vinyl-, Benzoic acid, 4-ethoxy-ethyl ester, Omega-3 fatty acid, Triethyl citrate, 3-0-methyl-d- glucose, Palmitic acid, Palmitic acid ethyl ester, Eicosatrienoic acid	NA
Gujarat, India, 2012 [8]	Experimental DOCA rat model	methanolic extract	NA	Anti-hypertensive property
Tamil Nadu, India, 2023 [9]		Methanolic extract	NA	Nootropic activity
Nantong, China, 2020 [10]		alkaline hydrolysis of crude resin glycosides	Evolvulic acids A, B and C	Cytotoxicity and anti-migration activities.
Tamil Nadu, India, 2020 [11]	In vitro	n-hexane, chloroform, ethyl acetate, methanol, and water by cold maceration method	2-(2-ethylhexoxycarbonyl) benzoic acid, (2E)-6-methoxy-2-[(4-methoxyphenyl) methylidene]-3,4-dihydronaphthalen-1-one, 8,8-Dimethyl-3,3a,4,5,6,7,8,8b-octahydro-2H-indeno [1,2-b] furan-2-one,3-[2-(1-methylimidazol-2-yl)sulfanylacetyl]chromen-2-one, Phenol,2,6-bis (1,1-dimethylethyl)-4-[(4-hydroxy-3,5-dimethylphenyl) methyl], [4-(7-acetyloxy-5-methoxy-4-oxochromen-2-yl)phenyl] acetate, 4(3H)-Quinazolinone and 3-(4-hydroxyphenyl)-2-(2-phenylethenyl)	Antioxidant, Neuroprotection, Anticholinesterase activity.
Gujarat, India, 2019 [12]	In vitro: Neuroprotection assays In vivo: Experimental scopolamine mice model	Methanolic extract	Chlorogenic acid β-carotene Scopoletin Betulinic acid Stigmasterol	Neuroprotection & Nootropic actions
Uttar Pradesh, India, 2019 [13]	Experimental scopolamine mice model	Ethanolic extract	NA	Nootropic activity

### **Anticonvulsant effects**

The extract's content of secondary metabolites such as flavonoids, tannins, and saponins was discovered using phytochemical screening. At dosages of 100–400 mg/kg, *E. alsinoides* extract protected the mice 50–100% from seizures caused by pentylenetetrazole (PTZ). The extract may interact with GABA-ergic neurotransmission, as evidenced by its ability to prevent PTZ-induced convulsions. Anticonvulsant medications that are effective against myoclonic and absence seizures are thought to be identified by the PTZ test. In mice, electrically induced seizures were considerably reduced by *E. alsinoides* [21].

## **Anti-inflammatory effects**

Stress can mimic the natural emotion of anxiety. Discrete discomfort is a common clinical presentation of excessive anxiety and frequently co-occurs with various medical and mental health conditions. Due to the numerous adverse effects of the majority of anxiolytic medications used in clinics, including drowsiness, muscular relaxation, and anterograde amnesia, people are looking for alternative medications. Several researchers have shown antistress effects from various extracts of EA. Both *C. pluricaulis* and *E. alsinoides*, two significant sources of vishnukranthi, have anxiolytic properties in a range of species. Aqueous methanol extracts of the entire plants of C. pluricaulis and E. alsinoides have the highest anxiolytic efficacy at doses of 100 and 200 mg/kg, respectively, according to Malik et al. (2011). According to Nahata et al. (2009), the best anxiolytic activities were found in the ethyl acetate fraction of the ethanol extracts of C. pluricaulis and E. alsinoides, and these activities were linked to their antioxidant properties. When E. alsinoides ethanolic extract given at doses of 200 and 400 mg kg-1 day-1, Swiss albino mice showed a decrease in the number of entries into closed arms, an increase in the number of entries into open arms, an increase in the amount of time spent in open arms and the light chamber, and an increase in the number of crossings into light and dark chambers [22].

# Adaptogenic activity

In a study, EA was given 45 min before the stress induction for one week at a dose of 200 mg/kg p.o., which was demonstrated to be effective and comparable to Panax quinquefolium 100mg/kg p.o. This activity was evaluated using a passive avoidance test in a scopolamine mice model.

#### The antioxidant activity

Ethanolic extracts and water infusion were evaluated using the 2, 22-azinobis-3-ethyl-benzothiazoline-6-

sulfonic acid radical cation decolorisation assay. Using spontaneous lipid peroxidation of rat brain homogenate, the inhibition of lipid peroxidation by plant infusions was tested, and IC50 values were calculated. The most potent ethanolic extract was Sida cordifolia (IC50 = 16.07  $\mu$ g/ml), followed by *E. alsinoides* (IC50 = 33.39  $\mu$ g/ml) and Cynodon dactylon (IC50 = 78.62  $\mu$ g/ml), according to the ABTS assay results. The water infusions' relative antioxidant capacity was noted in the order shown below: C. dactylon (IC50 273.64  $\mu$ g/ml) > S. cordifolia (IC50 342.82  $\mu$ g/ml) > *E. alsinoides* (IC50 172.25  $\mu$ g/ml). The following were the outcomes of the plants' water infusions on lipid peroxidation: C. dactylon (IC50 608.31  $\mu$ g/ml) > S. cordifolia (IC50 126.78  $\mu$ g/ml) and E.alsinoides (IC50 89.23  $\mu$ g/ml) [24].

# Anxiolytic and antidepressant effects

A typical definition of insomnia is a state of poor sleep quality brought on by trouble initiating or maintaining sleep even when one is in an environment that is conducive to sleep. A clinical investigation demonstrates that sleeplessness greatly decreased (p<0.01) in the trial group and that bodily discomfort, bruxism headaches, and nightmares also dramatically decreased (p<0.05). There are also noticeable changes in mood after waking up, sleep time, and sleep quality. In albino mice, moderate doses (200 mg/kg) of the alcoholic extract of *E. alsinoides* resulted in drowsiness, stupor, and decreased mobility; greater doses demonstrated that it was neither poisonous nor fatal [23].

### The analgesic activity

Pain is an unpleasant emotional and sensory experience caused by or warning of tissue damage. CNS circuits, mainly brainstem nuclei, regulate pain based on mood, memory, and cognition. Most studies on Convolvulaceae species used *in vivo* models. In Swiss albino mice, *Argyreia argentea* stem methanol extract reduced acetic acid- and formalin-induced pain at various doses. *A. nervosa* root, leaf, and aerial parts showed significant analgesic effects in multiple tests. An ethanol extract of *Calonyction aculeatum* fruits exhibited strong analgesic activity, linked to increased superoxide dismutase and decreased prostaglandin E2 and malondialdehyde levels [25].

### Neuroprotective properties of *E. alsinoides*

Reactive oxygen and nitrogen species are part of normal brain physiology but cause oxidative and nitrosative stress under pathological conditions, damaging lipids, proteins, DNA, and cellular structures. The CNS, rich in neural cells, is vulnerable to natural and synthetic toxins, leading to tissue damage and disorders. Certain Convolvulaceae species show neuroprotective effects.

 $E.\ alsinoides$  root extract protects male Wistar rats from aluminum-induced neurotoxicity. Its aqueous extract reduces lipid/protein damage and modulates key enzymes.  $C.\ pluricaulis$  methanol extract reduces  $H_2O_2$ -induced cell death in IMR32 cells by enhancing antioxidant defenses, both  $in\ vitro$  and  $in\ vivo$ .

*E. alsinoides* exhibits CNS effects including antidepressant, anti-Parkinson's, and anti-Huntington's actions. At 25–100 mg/kg/day, whole *C. pluricaulis* shows antidepressant activity. Its chloroform fraction reduces immobility in swim and suspension tests and counters reserpine effects. Methanol extract mitigates 3-nitropropionic acid-induced declines in motor activity, memory, weight, and antioxidant defense, suggesting potential for Huntington's disease treatment [26].

# Discussion

Many therapeutic herbs were used anciently, including Vishnukranthi, also known as *E. alsinoides* (Linn.) Linn., which is a noteworthy herb that has been used in therapeutic applications for millennia. Antimicrobial, anti-inflammatory, antidiabetic, and antioxidant properties are all possessed by *E. alsinoides* (Linn.) Linn. Numerous research has demonstrated that *E. alsinoides* (L.) L. has a nootropic effect and is a powerful herb for treating brain diseases.

Phytochemical analysis of methanolic extract reveals alkaloids, flavonoids, terpenoids, phenolics, tannins, saponins, and cardiac glycosides. These bioactives support pharmacological research and drug development. *E. alsinoides* alkaloids like evolvine show neuroprotective and anti-inflammatory effects [27]. Flavonoid-rich extracts exhibit strong antioxidant activity, reducing oxidative stress and protecting against diseases like neurodegenerative and cardiovascular disorders [28].

E. alsinoides terpenoids exhibit anti-inflammatory and antimicrobial effects, aiding in inflammatory disease management [29]. ROS, metabolic byproducts, cause oxidative stress when their accumulation exceeds the body's detoxification capacity. Antioxidant-rich diets help mitigate this by enhancing natural defenses [30]. The synergistic interaction of bioactives likely underlies the plant's broad therapeutic effects, supporting its use in inflammatory and cognitive disorders [31]. Phenolic compounds in the methanolic extract show strong positive correlation with antioxidant activity in (2,2-diphenyl-1-picrylhydrazyl) assay and ferric reducing/antioxidant power assays, linked to increased levels of total phenols, flavonoids, and proanthocyanidins [32].

*E.alsinoides* methanolic extract exhibit radical scavenging activity compared to standard industrial antioxidants. The ferric reducing/antioxidant power assay conducted on methanolic extract revealed that the flavonoids are shown to be the primary active compound to the plant's antioxidant activity. This study explains the importance of secondary metabolites [33].

The present systematic review did not identify any limitation in the study evidence or during the study process. This systemic review highlights the therapeutic potential of *E. alsinoides* and the necessity of advanced research in validating its traditional uses.

#### Conclusion

The results have established the chemical basis for the widespread use of this plant as a therapeutic agent to treat a wide range of ailments. *E. alsinoides* increases cognitive performance, lowers anxiety, and improves memory. It is also used to treat respiratory conditions, epilepsy, and insomnia. The plant is good for general health because it also has immunomodulatory and hepatoprotective properties. Numerous studies have shown that *E. alsinoides* is a potent herb for treating brain disorders and has a nootropic effect.

#### **Conflicts of interest**

Authors declare no conflicts of interest.

#### References

- Singh R, Singh B. A review on ethnomedical uses and pharmacology of *Evolvulus alsinoides*. J Pharm Pharmacol. 2009; 61:1003–1010.
- [2] Satyavati GV, Raina MK, Sharma M, editors. Medicinal Plants of India. Vol. 1. New Delhi: Indian Council of Medical Research; 1976.
- [3] Awere CO, Sneha A, Rakkammal K, Muthui MM, Kumari RA, et al. Carbon dot unravels accumulation of triterpenoid in *Evolvulus alsinoides* hairy roots culture by stimulating growth, redox reactions and ANN machine learning model prediction of metabolic stress response. Plant Physiol Biochem. 2024; 216:109142.
- [4] Mukundh ST, Veeraraghavan VP, Ponnusamy B, Jayaraman S. Phytochemical screening and antidiabetic activity of aqueous extract of *Evolvulus alsinoides* leaves: An *in vitro* and in silico study. J Pharm Bioallied Sci. 2024; 16:S1246–S1248.
- [5] Binth Siraj M, Khan AA, Jahangir U, Hashimi A, Ahmad Y, et al. Evaluation of the efficacy of hydro-alcoholic extract of *Evolvulus alsinoides* L. for the treatment of primary hypertension: A randomized controlled trial. J Ethnopharmacol. 2024; 323:117661.
- [6] Ather S, Bhattacharyya C, Gupta H, Patil Y, Palicherla SR, et al. Exploring the neuropharmacological properties of scopoletin-rich Evolvulus alsinoides extract using in-silico and in vitro methods. Am J Transl Res. 2024; 16:2103–2121.
- [7] Nithya K, Siddaraman R, Sheelajoice PP, Rajarathinam M, Bhopal Chandra V. Biochemical analysis of methanolic extract from *Evolvulus alsinoides*. Bioinformation. 2023; 19:1173–1178.
- [8] Joshi UH, Dabhi KR, Desai TR, Tirgar PR. Investigation of antihypertensive mechanism of *Evolvulus alsinoides* in DOCA salt induced hypertensive rats. J Pharm Res. 2012; 5:3613–3617.
- [9] Nithya K, Siddaraman R, Sheelajoice PP, Rajarathinam M, Chandra VB. Nootropic activity of methanolic extract from *Evolvulus alsinoides* Linn. in mice with scopolamine-induced amnesia. Bioinformation. 2023; 19:1212– 1216.
- [10] Xu JY, He Y, Zhang AW, Lu Y, Chen GT, et al. Isolation of evolvulic acids B and C, two new components of crude resin glycoside fraction from *Evolvulus alsinoides*. Nat Prod Res. 2021; 35:3766–3771.

- [11] Sundaramoorthy MK, Packiam KK. In vitro enzyme inhibitory and cytotoxic studies with Evolvulus alsinoides (Linn.) Linn. leaf extract: A plant from Ayurveda recognized as Dasapushpam for the management of Alzheimer's disease and diabetes mellitus. BMC Complement Med Ther. 2020; 20:129.
- [12] Sethiya NK, Nahata A, Singh PK, Mishra SH. Neuropharmacological evaluation on four traditional herbs used as nervine tonic and commonly available as Shankhpushpi in India. J Ayurveda Integr Med. 2019; 10:25– 31.
- [13] Yadav MK, Singh SK, Singh M, Mishra SS, Singh AK, et al. *In vivo* toxicity study of ethanolic extracts of *Evolvulus alsinoides* & Centella asiatica in Swiss albino mice. Open Access Maced J Med Sci. 2019; 7:1071–1076.
- [14] Tripathi YC, Sharma M, Singh A, Singh R, Kumar A, et al. Traditional uses and pharmacological properties of *Evolvulus alsinoides*: An overview. Indian J Nat Prod Resour. 2004; 3:20–25.
- [15] Rao K, Reddy P, Sharma S, Gupta R, Kumar N, et al. Traditional uses and phytochemistry of *Evolvulus alsinoides*. Indian J Tradit Knowl. 2015; 14:456–463.
- [16] Sharma P, Verma R, Singh A, Kumar S, Gupta R, et al. Therapeutic potential of *Evolvulus alsinoides*. J Ethnopharmacol. 2018; 222:1–10.
- [17] Abubakar K. Evaluation of the anticonvulsant effect of the methanol extract of Evolvulus alsinoides in mice. Scholars Acad I Pharm. 2013: 2:436–441.
- [18] Agarwal N, Dey CD. Behavioral and lethal effects of alcoholic extracts of Evolvulus alsinoides in albino mice. J Physiol Allied Sci. 1997; 31:81.
- [19] Cervenka F, Koleckar V, Rehakova Z, Jahodar L, Kunes J, et al. Evaluation of natural substances from *Evolvulus alsinoides* L. with the purpose of determining their antioxidant potency. J Enzyme Inhib Med Chem. 2008; 23:574–578.
- [20] Sethiya NK, Nahata A, Singh PK, Mishra SH. Neuropharmacological evaluation on four traditional herbs used as nervine tonic and commonly available as Shankhpushpi in India. J Ayurveda Integr Med. 2019; 10:25– 31
- [21] Thomas A, Burant A, Bui N, Graham D, Yuva-Paylor LA, et al. Marble burying reflects a repetitive and perseverative behavior more than novelty-induced anxiety. Psychopharmacology (Berl). 2009; 204:361–373.
- [22] Wagh S, Dhuri K. Vishnukranta (Evolvulus alsinoides Linn.): A clinical drug review. J Ayurveda Integr Med Sci. 2023; 8:149–152.
- [23] Agarwal N, Dey CD. Behavioral and lethal effects of alcoholic extracts of Evolvulus alsinoides in albino mice. J Physiol Allied Sci. 1997; 31:81.
- [24] Dhana Lekshmi UM, Reddy P. Preliminary studies on anti-inflammatory, antipyretic, and antidiarrhoeal properties of *Evolvulus alsinoides*. Turk J Biol. 2011; 35:611–618.
- [25] Sahu D, Bhushan S, Das D, Debnath SK, Barik L, et al. Potential Ayurvedic herbs for neurodegenerative diseases: A review. Res J Pharmacology Pharmacodyn. 2021; 13:69–74.
- [26] Vijayalakshmi N, Sasikumar JM. Phytochemical investigation of methanolic extract of the leaves of *Evolvulus alsinoides* Linn. Biosci Biotechnol Res Asia. 2010; 7:569–571.
- [27] Li X, Zhang Y, Chen W, Huang L, Wang Y, et al. GC-MS profiling of medicinal plants in Asia. J Med Chem. 2021; 64:3456–3468.
- [28] Ahmad S, Khan T, Ali M, Ansari MA, Farooqi IH, et al. Identification of secondary metabolites via GC-MS. Phytomed Res. 2021; 36:156–165.
- [29] Sharma K, Patel R, Tiwari S, Gupta R, Kumar S, et al. GC-MS based analysis of bioactive compounds. J Plant Biochem Biotechnol. 2020; 29:456–468.
- [30] Sethiya NK, Raja MK, Mishra SH. Antioxidant markers based TLC-DPPH differentiation on four commercialized botanical sources of Shankhpushpi (a Medhya Rasayana): A preliminary assessment. J Adv Pharm Technol Res. 2013; 4:25–30.
- [31] Chen R, Zhao Y, Liu H, Sun W, Zhou X, et al. Advances in phytochemistry of Evolvulus species. Nat Prod Res. 2019; 33:24–35.
- [32] Agarwal N, Dey CD. Behavioral and lethal effects of alcoholic extracts of Evolvulus alsinoides in albino mice. J Physiol Allied Sci. 1997; 31:81.