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An update on Ayurvedic herb *Convolvulus pluricaulis* Choisy

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## PEER REVIEW

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## Comments

This paper is a good review paper on Ayurvedic and pharmacological activities of *C. pluricaulis*. Citations used are also a good resources for reviewing and very informative to all the Ayurvedic and traditional practitioners.

Details on Page 251

## ABSTRACT

*Convolvulus pluricaulis* Choisy (*C. pluricaulis*) is a perennial herb that seems like morning glory. All parts of the herb are known to possess therapeutic benefits. The plant is used locally in Indian and Chinese medicine to cure various diseases. It is used in Ayurvedic formulation for chronic cough, sleeplessness, epilepsy, hallucinations, anxiety etc. Based on the comprehensive review of plant profile, pharmacognosy, phytochemistry, pharmacological and toxicological data on the *C. pluricaulis*, there will be more opportunities for the future research and development on the herb *C. pluricaulis*. Information on the *C. pluricaulis* was collected via electronic search (using Pub Med, SciFinder, Google Scholar and Web of Science) and library search for articles published in peer-reviewed journals. Furthermore, information also was obtained from some local books on ethnopharmacology. This paper covers the literature, primarily pharmacological, from 1985 to the end of 2012. The *C. pluricaulis* is an important indigenous medicine, which has a long medicinal application for liver disease, epileptic disease, microbial disease, cytotoxic and viral diseases, central nervous system (CNS) disease in Ayurvedic medicine, traditional Chinese medicine and other indigenous medical systems. The isolated metabolites and crude extract have exhibited a wide of *in vitro* and *in vivo* pharmacological effect, including CNS depression, anxiolytic, tranquillizing, antidepressant, antistress, neurodegenerative, anti-amnesic, antioxidant, hypolipidemic, immunomodulatory, analgesic, antifungal, antibacterial, antidiabetic, anti-ulcer, anticatatonc, and cardiovascular activity. A chemical study of this plant was then initiated, which led to the isolation of carbohydrates, proteins, alkaloids, fatty acids, steroids, coumarins, flavanoids, and glycosides as active chemicals that bring about its biological effects. A series of pharmacognostical studies of this plant show that it is a herb, its stem and leaves are hairy, more over it has two types of stomata, anisocytic and paracytic. A herb, *C. pluricaulis* has emerged as a good source of the traditional medicine for the treatment of liver disease, epileptic disease, microbial disease, cytotoxic and viral diseases, and CNS disease. Pharmacological results have validated the use of this species in traditional medicine. All the parts of the herb are known to possess therapeutic benefits. Expansion of research materials would provide more opportunities for the discovery of new bioactive principles from *C. pluricaulis*.

## KEYWORDS

*Convolvulus pluricaulis* Choisy, Pharmacognosy, Microscopy, Macroscopy, Phytochemistry, Pharmacology

## 1. Introduction

In the last few years, there has been an exponential growth in the field of herbal medicine, and these drugs are gaining popularity both in developing and developed countries because of their natural origin and less side effects[1]. Early

humans recognized their dependence on nature for a healthy life, and since that time humanity has depended on the diversity of plant resources for food, clothing, shelter, and medicine to cure myriads of ailments[2]. Shankhpushpi of the Ayurvedic pharmacopeia of India consists of the whole plant of *Convolvulus pluricaulis* Choisy (Convolvulaceae)

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syn (*C. pluricaulis*) and *Convolvulus microphyllus* Sieb. ex Spreng (*C. microphyllus*)<sup>[3]</sup>. Plants other than *C. pluricaulis* use the name Shankhpushpi in different parts of the country. These include *Evolvulus alsinoides* Linn, *Clitoria ternatea* Linn and *Canscora decussata* Schult.

Indian Council of Medical Research has given quality standards for *C. pluricaulis* drug in its publication<sup>[4]</sup>. Although these plants proved their scientific potential in central nervous system depression, anxiolytic, tranquillizing, antidepressant, antistress, neurodegenerative, anti-amnesic, antioxidant, hypolipidemic, immunomodulatory, analgesic, antifungal, antibacterial, antidiabetic, anti-ulcer, anticatatonie, and cardiovascular activity. These are reported to contain several types of alkaloids, flavanoids, and coumarins as active chemicals that bring about its biological effects<sup>[5]</sup>.

The plant has been found to be effective in reducing different types of stress including psychological, chemical and traumatic. The ethanolic and methanolic extracts of the whole plant reduced spontaneous motor activity, potentiated pentobarbitone hypnosis and morphine analgesia, reduced fighting response, abolished the conditioned avoidance response, antagonized convulsive seizures and tremorine induced tremors in mice. The juice of whole plant prevents excessive menstruation. The fine paste made by grinding the plant is helpful to cure abscess. Ethanolic extract of whole plant when administered to cholesterol fed gerbils, reduced serum cholesterol, Low density lipoprotein cholesterol, triglycerides and phospholipids significantly after 90 d. The root extract of this plant regulated hyperthyroidism in female mice. The juice of fresh whole plant of *C. pluricaulis* possessed anti-ulcerogenic effect and is comparable to sucralfate. Ethanolic extract of the entire plant exerted a negative inotropic action on amphibian and mammalian myocardium. It also exerted spasmolytic activity on smooth muscles<sup>[6]</sup>.

### 1.1. Plant profile and synonyms

Figure 1 shows the profile of this plant, and the synonyms of this plant include *C. pluricaulis* and *C. microphyllus*<sup>[7]</sup>.



Figure 1. *C. pluricaulis*.

### 1.2. Scientific classification

The scientific classification of *C. pluricaulis* is demonstrated as follows<sup>[8]</sup>:

Kingdom:	Plantae
Sub-kingdom:	Tracheobionta
Super-division:	Spermatophyta
Division:	Magnoliophyta
Class:	Magnoliopsida
Sub-class:	Asteridae
Order:	Solanales
Family:	Convolvulaceae
Genus:	<i>Convolvulus</i>
Species:	<i>pluricaulis</i>

### 1.3. Vernacular names

The vernacular names of *C. pluricaulis* is described as follows:

Sanskrit:	<i>Sankhapuspa</i>
Bengal:	<i>Sankhapuspi</i>
Gujarathi:	<i>Shankhavali</i>
Hindi:	<i>Shankhapushpi, Aparajit</i>
Kannada:	<i>Bilikanthisoppu</i>
Marathi:	<i>Shankhavela</i>
Punjabi:	<i>Shankhapuspi</i>
Tamil:	<i>Sanghupushpam, kakkurattai</i>
Telugu:	<i>Shankhapushpi</i>

### 1.4. Description

*C. pluricaulis* is a perennial herb that seems like morning glory. Its branches are spread on the ground and can be more than 30 cm long. The flowers are blue in color (5 mm) and the leaves, which are elliptic in shape (2 mm), are located at alternate positions with branches or flowers. Known as *Aloe* weed in English, the herb is commonly found in India, especially in the state of Bihar<sup>[9]</sup>.

### 1.5. Chemical constituents

The chemical constituents of *C. pluricaulis* are shown in Table 1<sup>[5]</sup>.

### 1.6. Medicinal importance of *C. pluricaulis*

*C. pluricaulis* is of various medicinal uses. It is used for treatment of hypertension, neurodegenerative diseases, ulcers, high blood pressure, epilepsy, vomiting, diabetes, sun stroke and bleeding. In addition, it can also be used to improve memory and decrease cholesterol<sup>[10]</sup>.

### 1.7. Traditional uses

Many previous studies have reported the traditional uses

**Table 1**Chemical constituents of *C. pluricaulis*.

Class	Chemical constituents
Carbohydrats	D–glucose, maltose, rhamnose, sucrose, starch and other carbohydrates
Proteins and amino acids	Proteins and amino acids
Alkaloids	Shankhpushpine, convolamine, convoline, convolidine, convolvine, confoline, convosine
Fatty acids/volatile acids/fixed oil	Volatile oils, fatty acids, fatty alcohols, hydrocarbons, myristic acids, palmitic acids and linoleic acids
Phenolic/glycosides/triterpenoids/steroids	Scopoletin, $\beta$ -sitosterol, ceryl alcohols, 20-oxodotriacontanol, tetratriacontanoic acids, flavonoid–kämpferol, steroids–phytosterols

of *C. pluricaulis*. This plant is reported to be a prominent memory improving drug, a psychostimulant and tranquilize, and reduce mental tension. There is a pertinent reference in Ayurvedic literature about the use of the drug as brain tonic in hypotensive syndromes. The pharmacological studies of the herb have shown varying degree of its hypotensive and tranquilizing effects. Clinical studies have exhibited demonstrable beneficial effects of *C. pluricaulis* on the patients of anxiety neurosis. The herb induces a feeling of calm and peace, good sleep and a relief in anxiety, stresses, mental fatigue, producing a significant reduction in the level of anxiety, neuroticism arising due to various levels of stresses. The herb appears to produce its action by modulation of neurochemistry of the brain. The plant improves the balance and vitiation in kapha–vata–pitta doshas, and the herb is astringent and bitter<sup>[11]</sup>.

## 2. Macroscopic characters

Preliminary macroscopical characters of ethanolic extracts of *C. pluricaulis* (leaves) are given in Table 2<sup>[12]</sup>.

**Table 2**Preliminary macroscopical characters of ethanolic extracts of *C. pluricaulis* (leaves).

<i>C. pluricaulis</i>	Characters	
Stem structures	Length	Several prostrate stems (10–30 cm)
	Surface	Clothed with silky hairs
	Internodes	10–12 mm
	Taste	Tasteless
Leaf structures	Dimension	Length=1.12 cm; breadth=0.1 cm
	Attachment	Leaf stalk absent
	Lamina	Thin
	Stipules	Exstipulated
	Leaf lamina shape	Linear
	Leaf margin	Entire
	Leaf apex	Acute
	Leaf base	Decurrent
	Leaf texture	Whole (brittle)
	Venation	Parallel
	Phyllotaxy	Alternate
	Leaf surface	Hairy

## 3. Microscopic characters

Preliminary microscopical characters of ethanolic extracts of *C. pluricaulis* (leaves) are given in Table 3<sup>[13]</sup>.

**Table 3**Preliminary microscopical characters of ethanolic extracts of *C. pluricaulis* (leaves).

<i>C. pluricaulis</i>	Characters		
Stem structures	Outline in transverse section	Terete, wings absent	
	Cuticle	Straited	
	Trichomes covering	Present, conical, unicellular	
	Glandular	Present, stalk unicellular, head multicellular	
	Chlorenchyma	Present	
	Collenchyma	Present	
	Endodermis	Indistinct	
	Pericyclic fibers	Present	
	Phloem fibers	Present	
	Pith	Cells pitted in older stem	
	Leaf structures	Outline in transverse section	Concave–convex
		Collenchyma	Present beneath upper epidermis
Calcium oxalate		Plenty, along veins	
Lamina		Isobilateral	
Cuticle		Straited	
Trichomes		Present	
Stomata		Both anisocytic and paracytic types on either side	
Stomata number		Upper surface	202–216–238
	Lower surface	188–223–251	
Stomatal index	Upper surface	16.9–18.0–17.2	
	Lower surface	14.8–16.3–17.2	
	Vein–islet number	7.5–8.0–9.0	
Extractive value	Water soluble	18.21	
	Alcohol soluble	16.14	

## 4. Pharmacological activities

Preliminary pharmacological activities of ethanolic extracts of *C. pluricaulis* (leaves) are given in Table 4<sup>[14–29]</sup>.

## 5. Phytochemistry

The preliminary phytochemical screening carried out on ethanolic extracts of *C. pluricaulis* (leaves) revealed the presence of phytoconstituents such as alkaloids, glycosides, flavonoids, carbohydrates, proteins, sterols, gum and mucilages compounds. Diverse pharmacological properties and structurally novel compounds have been found for the alkaloids, flavanoids, glycosides, and steroids in *C. pluricaulis* suggesting that these compounds may be the

**Table 4**Preliminary pharmacological activities of ethanolic extracts of *C. pluricaulis* (leaves).

Activity	Plant part/ extract	Dose/model	Standard Drug	Result
Antioxidant activity	Whole part/ chloroform	84%, 83%, 48%/DPPH model	Ascorbic acid	The <i>C. pluricaulis</i> extract possesses significant anticonvulsant activity when tested <i>in vitro</i> .
Antioxidant activity	Whole part/ methanolic	41 µg/mL/DPPH model	Ascorbic acid	The <i>C. pluricaulis</i> extract demonstrated significant free radical scavenging effect.
Anticonvulsant activity	Whole part/ methanolic	500, 1 000 mg/kg/MES model	Phenytoin	The <i>C. pluricaulis</i> extract at this dose didn't abolish the hind limb extension, but reduced the mean recovery time from convulsion.
Antidepressant activity	Whole part/ ethanolic	50, 100 mg/kg/TST and FST model	Imipramine or fluoxetine	The result showed that only chloroform fraction in this doses significantly reduced the immobility time in both FST & TST.
Anxiolytic activity	Aerial part/ ethanolic	200 mg/kg/EPM model	Diazepam	The result showed that ethyl acetate fractions at this dose reduced the neuromuscular co-ordination indicative of the muscle relaxant activity.
Anxiolytic activity	Flower part/ ethanolic	100, 200, 400 mg/kg/EPM model	Diazepam	The result demonstrated that the flower extract of plant exerted anxiolytic effect in mice on EPM.
Learning behavior and memory enhancement activity	Whole part/ ethanolic	100 mg/kg/passive avoidance paradigms and active avoidance test	Piracetam	The <i>C. pluricaulis</i> extract exhibited potent memory enhancing effects.
Learning behavior and memory enhancement activity	Root part/ ethanolic	200 mg/kg/passive avoidance paradigms and active avoidance test	Piracetam	The result shown that higher retention was observed with plant extract as compared with standard drug.
Anti thyroid activity	Root part/ ethanolic	0.4 mg/kg/ radioimmunoassay technique	Methimazole	The result indicated that <i>C. pluricaulis</i> extract inducing inhibition in thyroid function was primarily mediated through T4 to T3 conversion.
Antiulcer activity	Whole part/ ethanolic	375, 750 mg/kg/gastric ulcer model	Sucralfate	The result was found due to augmentation of mucosal defensive factors like mucin secretion rather than acid pepsin.
Antiobsessive activity	Whole part/ methanolic	200, 400 mg/kg/rota rod, hole board test	Fluoxetine, diazepam	The result shown that <i>C. pluricaulis</i> extract can modulate serotonin or dopaminergic levels.
Neuroprotective activity	Whole part/ aqueous	150 mg/kg/EPM, MWM model	Rivastigmine tartrate	The result shown that when scopolamine is induced, the <i>C. pluricaulis</i> extract may exert its potent enhancing activity through anti-AChE and antioxidant action.
Neuroprotective activity	Whole part/ aqueous	150 mg/kg/ EPM, MWM model	Rivastigmine tartrate	The result shown that when aluminium chloride is induced, the <i>C. pluricaulis</i> extract possesses neuroprotective potential, thus validating its use in alleviating toxic effects of aluminium.
Hepatoprotective activity	Leaves part/ ethanolic	200, 400, 600 mg/kg/ thioacetamide induced liver damage in rats	Silymarine	The result shown that <i>C. pluricaulis</i> extract possesses significant hepatoprotective property in thioacetamide induced liver toxicity in rat model.
Anti-bacterial activity	Whole part/ methanolic	<i>Escherichia coli</i> ATCC 8739, <i>Staphylococcus aureus</i> 6538 / Cup plate Model	Tetracycline	The result shown that <i>C. pluricaulis</i> extract is more active against <i>Escherichia coli</i> in comparison to <i>Staphylococcus aureus</i> .
Antiviral activity	Whole part/ aqueous	150 mg/kg/scopolamine induced increased tau and amyloid precursor protein	Rivastigmine	The result shown that <i>C. pluricaulis</i> extract reduced the increased protein and mRNA levels of tau and AβPP levels followed by reduction in Aβ levels compared with scopolamine treated group.
Nootropic activity	Whole part/ ethanolic	250, 500 mg/kg/Cook and Weidley's pole climbing model	Piracetam	The result shown that <i>C. pluricaulis</i> extract is less effective than other species of <i>Shankhpuspi</i> ( <i>Evolvulus alsinoides</i> ).

DPPH: 1,1-diphenyl-2-picryl-hydrazyl, MES: maximal electro shock, TST: tail suspension test, FST: forced swim test, EPM: elevated plus maze, MWM: morris water maze, CNS: central nervous system, AβPP: amyloid precursor protein.

major contributors for the traditional therapeutical effects of *C. pluricaulis*. Other compounds such as proteins, gum and mucilages have been also reported in *C. pluricaulis*.

### 5.1. Physical analysis

The physical analysis of *C. pluricaulis* are given in Table 5[30].

**Table 5**  
Physical analysis of *C. pluricaulis*.

Parameters	Values
Foreign matter analysis	(1.1350±0.1407)% w/w
Loss on drying	(11.8500±0.7188)% w/w
Total ash	(7.1300±0.3371)% w/w
Acid insoluble ash	(3.9500±0.3905)% w/w
Water soluble ash	(1.9500±0.1528)% w/w
Swelling index	Absent
Foaming index	Less than 100
Phosphate 1% solution	7.22
Phosphate 10% solution	7.53
Extractive value	Hot extraction (w/w)
Petroleum ether	(0.8000±0.0288)%
Chloroform	(0.9250±0.0866)%
Acetone	(1.0750±0.1507)%
Methanol	(2.0000±0.0803)%
Hydro-alcohol	(4.9750±0.3744)%
Aqueous	(16.9300±1.0760)%
Ethanol	(0.1189±0.0321)%

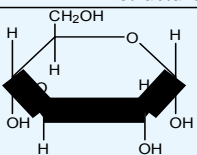
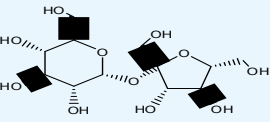
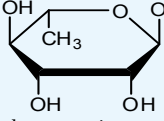
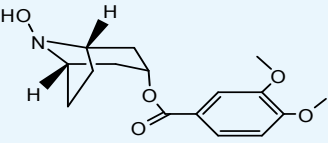
### 5.2. Phytochemical test

The preliminary phytochemical test of ethanolic extracts of *C. pluricaulis* (leaves) are given in Table 6[31,32].

### 5.3. Phytochemical structures

The phytochemical structures present in *C. pluricaulis* are given in Table 7[33,34].

**Table 7**  
Phytochemical structures present in *C. pluricaulis*.

Chemical name	Structure
D-glucose	 <p>D-glucose is also known as dextrose or grape sugar. It is a simple monosaccharide found in the plants</p>
Maltose	 <p>Maltose is also known as maltobiose or malt sugar, a disaccharide formed from two units of glucose joined with <math>\alpha</math> bond</p>
Rhamnose	 <p>Rhamnose is a naturally occurring deoxy sugar</p>
Sucrose	<p>Sucrose is the organic compound commonly known as table sugar and sometimes called saccharose</p>
Convolvine	 <p>Convolvine is an alkaloid, present in the leaves and stem of this species</p>

**Table 6**

Preliminary phytochemical test of ethanolic extracts of *C. pluricaulis* (leaves).

Phytochemical tests	Results
Test for alkaloids	+
Test for glycosides	+
Test for carbohydrates	+
Test for saponins	-
Test for fats and oils	-
Test for flavonoids	+
Test for tannis and phenolic compounds	-
Test for protein	+
Test for gums and mucilage	+
Test for steroids	+

+: presence of compound; -: absence of compound.

## 6. Current Ayurvedic formulation

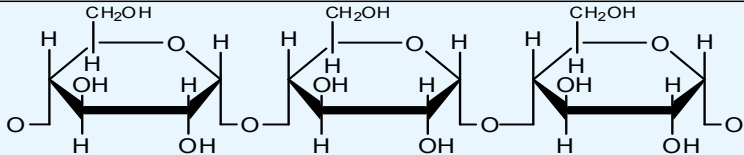
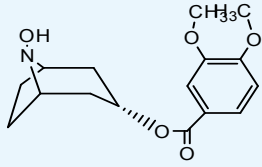


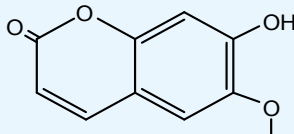
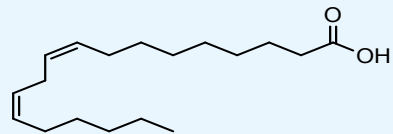
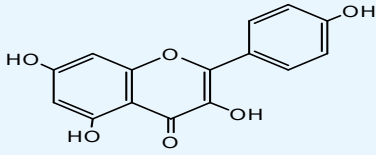
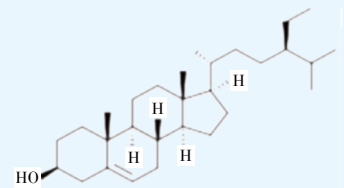

Many medicines are currently available in India, in which after mixing numerous plant extracts or powders with two or three *Medhya* plants including *C. pluricaulis* Ayurvedic formulation is developed[35]. Some preparations have been subjected to clinical trials. Examples include:

### 6.1. Remem (Zydus Industries, India)

The syrup and tablets include the following 10 species: *Centella asiatica* (*C. asiatica*), *Celastrus paniculatus* (*C. paniculatus*), *C. pluricaulis*, *Asparagus racemosus* (*A. racemosus*), *Acorus calamus* (*A. calamus*), *Embelia ribes* (*E. ribes*), *Tinospora cordifolia*, *Achyranthes aspera*, *Terminalia*

Table 7, continued

Phytochemical structures present in *C. pluricaulis*.

Starch	 <p>Starch or amyllum is a carbohydrate consisting of a large number of glucose units joined by glycosidic bonds</p>
convoline	
Myristic acid	 <p>Myristic acid also called tetradecanoic acid, is a common saturated fatty acids</p>
Palmitic acid	 <p>Palmitic acid also called hexadecanoic acid, is the most common fatty acid found in animals, plant and microorganism</p>
Scopoletin	 <p>Scopoletin is a coumarin found in root of plants in the genus scopolia</p>
Linoleic acid	 <p>Linoleic acid belongs to one of the two families of essential fatty acids; it is an unsaturated n-6 fatty acid</p>
Kampferol	 <p>Kampferol is a natural flavonol, a type of flavonoid; kaempferol have a wide range of pharmacological activities, including antioxidant, anti-inflammatory, antimicrobial, anticancer, cardioprotective, neuroprotective, antidiabetic, anti-osteoporotic, estrogenic/antiestrogenic, anxiolytic, analgesic and antiallergic activities</p>
$\beta$ -sitosterol	 <p><math>\beta</math>-sitosterol is one of several phytosterols (plant sterols) with chemical structures similar to that of cholesterol. It is used in treating hypercholesterolemia</p>
Cetyl alcohol	 <p>Cetyl alcohol, also known as 1-hexadecanol and palmityl alcohol, is a fatty alcohol</p>

*chebula* and *Saussurea lappa*<sup>[35]</sup>.

## 6.2. Tirukati

*Tirukati* includes 13 species: *Bacopa monnieri*, *C. pluricaulis*, *C. asiatica*, *A. racemosus*, *Valeriana wallichii*, *Rueraria tuberosa*, *Saussurea lappa*, *E. ribes*, *Tinospora*

*cordifolia*, *Operculina turpethum*, *Pavonia odorata*, *Caryophyllus aromaticus* and *Foeniculum vulgare*<sup>[35]</sup>.

## 6.3. Ayumemo (Welexlabs, India)

*Ayumemo* consists of 5 species: *C. asiatica*, *C. pluricaulis*, *C. paniculatus*, *Withania somnifera*, and *A. racemosus*<sup>[35]</sup>.



#### 6.4. Abana (The Himalaya Drug and Co, India)

The syrup and tablets include 19 species: *C. asiatica*, *C. pluricaulis*, *C. paniculatus*, *Balsamodendron mukul*, *Ocimum sanctum*, *Nardostachys jatamansi*, *Piper longum*, *Carum copticum*, *Zingiber officinalis*, *Cyperus rotundus*, *A. calamus*, *E. ribes*, *Syzygium aromaticum*, *Santalum album*, *Elettaria cardamomum*, *Foeniculum vulgare*, *Rosa damascena*, *Cinnamomum cassia* and *Crocus sativus*<sup>[35]</sup>.

#### 6.5. Tejras (Sandu Brothers, India)

The syrup consists of the following 12 species: *C. asiatica*, *C. pluricaulis*, *C. paniculatus*, *Eclipta alba*, *Cynodon dactylon*, *A. racemosus*, *Withania somnifera*, *Nardostachys jatamansi*, *A. calamus*, *Zingiber officinalis* and *Vetiveria zizanioides*<sup>[35]</sup>.

#### 6.6. Shankhapushpi (Unjha Pharmacy, India)

The syrup includes 6 species: *C. pluricaulis*, *C. asiatica*, *Nardostachys jatamansi*, *Nepeia hindostana*, *Nepeia elliptica* and *Onosma brateatum*<sup>[35]</sup>.

### 7. Toxicity

The LD<sub>50</sub> of the whole extract of *C. microphyllus* by oral administration was found to be 1250 (1000–1400) mg/kg. Mice treated with the extract showed a sedative effect at doses greater than 200 mg/kg and reflected a moderate to marked decrease in locomotor activity which lasted 1–2 h. The decrease in motor activity due to spontaneous motor activity was observed during the study. At a higher dose (more than 1 g/kg) animals died due to respiratory distress<sup>[36]</sup>.

### 8. Conclusion

The present review discusses the plant profile, pharmacognosy, pharmacology, phytochemistry of the herb, *C. pluricauli*. Glycosides, flavonoids, alkaloids, carbohydrates, steroids, proteins, gums and mucilage compounds are commonly present in this species. Pharmacological studies carried out on crude extracts and pure metabolites provided pragmatic documents for its traditional uses, and have revealed this herb to be a valuable source for medicinally important molecules.

#### Conflict of interest statement

We declare that we have no conflict of interest.

### Acknowledgements

The authors are thankful to the authorities of Bundelkhand University Jhansi for providing support to the study and other necessary facility like internet surfing, library and other technical support to write a review article.

### Comments

#### Background

This is a review paper on the benefits of *C. pluricaulis* as an alternative medicine for many diseases. The pharmacological effects exhibited by this plant have been elaborated in depth with citations from studies that have been conducted using this Ayurvedic plant.

#### Research frontiers

There is no lab experiment being done in this manuscript since it is a review paper. However, the author cited latest and recent publications on works done in this particular field, in which bring the readers to the recent analytical approach for pharmacological potential of this plant.

#### Related reports

The author cited different papers in his manuscript to support the therapeutic potential of *C. pluricaulis* in traditional medicine. Past studies mostly presented the pharmacological activities of this plant done *in vitro* and *in vivo*.

#### Innovations and breakthroughs

This review paper is one of its own in which it summarizes any research that have been conducted on *C. pluricaulis* specifically in medicinal field. It is a good source of literature survey for researchers who intended to do studies in this particular field, and use this plant.

#### Applications

This paper could be applied by most Ayurvedic practitioners in their medication activities to treat patients with different types of diseases.

#### Peer review

This paper is a good review paper on Ayurvedic and pharmacological activities of *C. pluricaulis*. Citations used are also a good resources for reviewing and very informative to all the Ayurvedic and traditional practitioners.

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