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## A review on *Cissus quadrangularis*

**Ayesha Siddiqua and Sirisha Mittapally**

### Abstract

*Cissus quadrangularis* is a succulent herbal plant belonging to family, Vitaceae. It is fleshy, cactus in nature. It is also known as *Vitis quadrangularis*, *Lycopodium imbricatum* or *Heliotropium indicum*. In Ayurveda, it is used as Pachana (digestive aid), Sara (relieves constipation), Athiyuk (strengthening bones), Vrushya (Aphrodisiac), etc. In Unani, it is used to treat gastritis. The whole plant is used in treatment of asthma, powdered root is specifically used in treatment of bone fractures. The usual dose of the powder is 30-40 grains. Leaves and young shoots are frequently taken with curry in Southern India. In Chennai, young shoots of the plant are dried, powdered, burnt to ashes in a closed vessel. These ashes are administered in dyspepsia, indigestion and certain bowel complaints. Leaves and young shoots are also considered as powerful alternatives in the gastro intestinal treatments. Juice of stem is dropped into the ear in otorrhoea and into the nose in epistaxis. The plant has many therapeutic uses.

**Keywords:** *Vitis quadrangularis*, Hadjod, Hadsankal, Harjora, Nalleru, Vajravalli, Kandvel, Hadavhanga, Piranti, Vedhari, Horjora, Harbhanga

### 1. Introduction

*Cissus quadrangularis* is commonly known as (Hadjod) is a perennial plant of the family Vitaceae. It is also known as Adamant creeper, Square stalked vine, veldt grape, devil's backbone, adamant creeper, asthisamharaka, hadjod and pirandai, Sannalam, Nalleru, Vajravalli, Mangara valli.

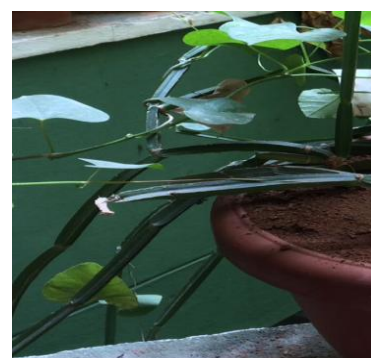
It is native to India, Bangladesh and Sri Lanka. It is also found in Africa and Southeast Asia. It is being imported to Brazil and the southern United States.

*Cissus quadrangularis* reaches a height of 1.5 m and has quadrangular-sectioned branches with internodes of about 8 to 10 cm long and 1.2 to 1.5 cm wide. Along each angle is a leathery edge. The Toothed trilobe leaves 2 to 5 cm wide appear at the nodes.

Each has a tendril emerging from the opposite side of the node. Racemes of small white, yellowish, or greenish flowers, globular berries are red when ripe [3].



**Fig 1:** *Cissus quadrangularis* Linn.



**Fig 2:** Stems and Leaves of *Cissus quadrangularis* Plant

### Vernacular names

English	:	Edible stemmed vine, Adamant creeper, Bone setter
Hindi	:	Hadjod, Hadjora, Hadsarihari, Harsankari, Kandvel
Bengali	:	Har, Harbhanga, Hasjora, Horjora
Gujarati	:	Chodhari, Hadsand, Hadsankal, Vedhari
Kanada	:	Mangarahalli
Malyalam	:	Cannalamparanta, Peranta

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Marathi	:	Horjora, Harsankar, Kandavel,
Nalllar	:	
Tamil	:	Piranti, Vajjiravalli
Telugu	:	Nalleru, Nelleratiga, Vajravalli
Oriya	:	Hadavhanga
Urdu	:	Harjora, Hadsankal

**Pharmacognosy of *Cissus quadrangularis***

**Taxonomy of *Cissus quadrangularis***

Kingdom	:	Plantae
Subkingdom	:	Tracheobionta
Super division	:	spermatophyta
Division	:	Magnoliophyta
Class	:	Magnoliopsida
Subclass	:	Rosidae
Order	:	Vitales
Family	:	Vitaceae
Genus	:	<i>Cissus</i>
Species	:	<i>quadrangularis</i>

**History**

*Cissus quadrangularis* is a succulent vine from Asia and Africa. It is one of the most commonly used medicinal plants in Thailand. It is traditionally used in African medicine as well as in Ayurveda. All parts of the plant are used for medicine.

*Cissus quadrangularis* is a traditional medicine usually said to come from Ayurveda but appears to have a wide range of locations which have used it medicinally due to its growing in numerous locations. Traditionally it was mostly used in treatment of female disorders (menopause, libido, and menstrual disorders) and treating bone disorders (increasing bone mass or accelerating fracture healing rates) which gives it the traditional name of the ‘Bone Setter’ (Hadjod), some other traditional usages are in regards to its supposed antiulcer properties, Antihemorrhoid properties, pain relieving properties and wound healing properties [10].



**Fig 3:** *Cissus quadrangularis* Dried stems

**Traditional uses**

**In Ayurveda**

- Asthiyuk -strengthens bones.
- Sara -induces mobility, causes diarrhoea, purgation, relieves constipation
- Krumighna -Relieves worm infestation, useful in infected wounds
- Amaghna -Relieves ama – a product of indigestion and altered metabolism.

- Vrushya -aphrodisiac, improves vigor
- Pachana - Digestive, relieves Ama Dosha
- Pittala -Increases Pitta Dosha

It is used in the treatment of obesity, gout, syphilis, Venereal diseases, leucorrhoea, worm infestation, anorexia, diabetes, peptic ulcer, haemorrhoids and high cholesterol.

It is also used as a body building supplement. In North eastern states of India, its stem is used as a vegetable.

In Siddha system of medicine, it is used for healing bone fracture, piles, as an anti-aging herb, in Asthma, cough and gonorrhoea [17].

**How to use *Cissus quadrangularis* in Ayurvedic Preparations**

*Cissus quadrangularis* stem is fried in ghee and administered with milk as for the treatment of wound healing, fractures and osteo-arthritis.

*Cissus quadrangularis* stem is processed in sesame oil is very useful to treat Sandhivata. In Tamil Nadu, its Chutney is prepared with coconut and served as side dish, used for improving immunity. In Kerala, traditional healers use its paste to apply over fractured or displaced joints. Its soup is also served to quicken the bone healing process. In Southern India, the stems of the plant is eaten as a pickle so as to strengthen the bones and for regaining the damage of epithelial cells in case of any injury [18].



**Fig 4:** *Cissus quadrangularis* Pickle.

**Ayurvedic medicine with *Cissus* as ingredient**

**Lakshadi Guggul:** widely used in the Ayurvedic treatment for of bone related diseases and fracture healing. Zeotone soft gel capsule

**Panchajeeraka Gudam:** An effective Ayurvedic medicine for post-natal care, useful in digestive and respiratory diseases. It is in herbal jam form [14].

**In Unani**

*Cissus quadrangularis* is a plant found in hotter parts of India. Powdered root is used as a specific for the fractures of the bones, with the same effects as plasters externally. Dose of the powder is 30-40 grains. “Leaves and young shoots are frequently taken with curry in Southern India. In Madras, young shoots of the plant are dried and powdered, are burnt to ashes in a closed vessel and administered in dyspepsia and indigestion” and certain bowel complaints. Leaves and young shoots are also considered as powerful alternatives. Juice of stem is dropped into the ear in otorrhoea and into the nose in epistaxis. It has also a reputation in scurvy and in irregular menstruation. Stem beaten into a paste is used to treat asthma.

A preserve of stem prepared by boiling it in lime water is useful stomachic [8].

In Medicinal Plants-Germplasm of Peninsular India the *Cissus quadrangularis* uses is mentioned as the stem and whole plant is used in asthma, bowel complaints and as epistatic; stem is useful in piles, diseases of the ear and bleeding of nose, paste of the stem is useful in muscular pains, burns, wounds, bites of poisonous insects and for saddle sores of horses and camels; root used in fractures and cuts.

The stem of Hadjod or *Cissus quadrangularis* is used for the treatment of gastritis, bone fractures, skin infections, constipations, eye diseases, piles, anaemia, asthma.

The stem juice is useful in scurvy and in irregular menstruation.

The powder of dried shoot is useful in digestive problems and wound healing property. Stem paste is useful for muscular pains, burns, wounds, bites of poisonous insects and sores.

In case of bone fracture, the stem is fried in oil and apply on the site of fracture before application of splint/cast. Hadjod or Bone Setter has proven ability to join broken bones. Studies have shown, the presence of vitamins and anabolic steroid, which may act on estrogenic receptors of the bone [11].

The plant helps in early ossification and remodelling of bones.

The oral intake of plant, helps in quick healing of fracture by stimulation of metabolism and increased uptake of the

minerals calcium, sulphur and strontium by the osteoblasts in fractured bone [21].

### Dosage of Hadjod or *Cissus quadrangularis* in unani medicine

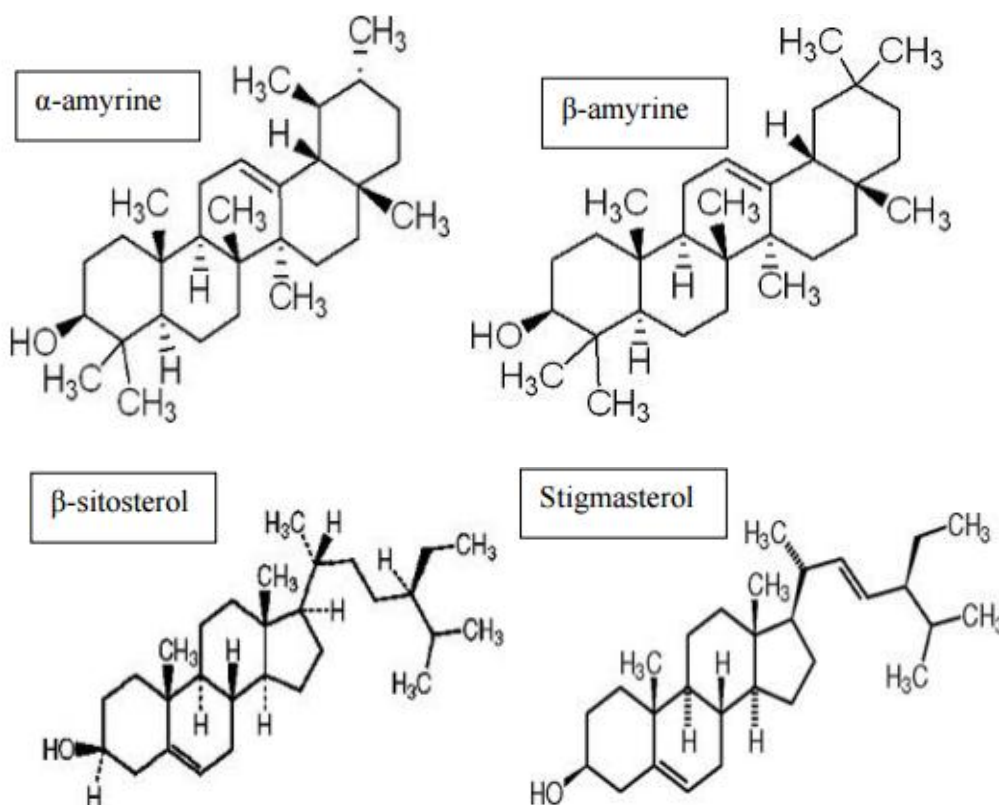
Decoction of dried stem: 10-30 ml twice a day.

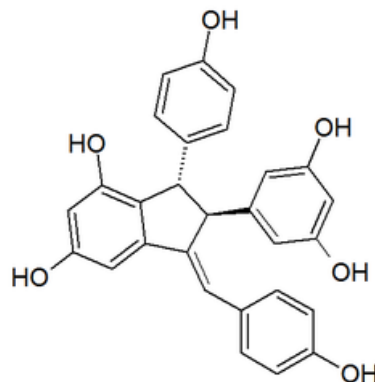
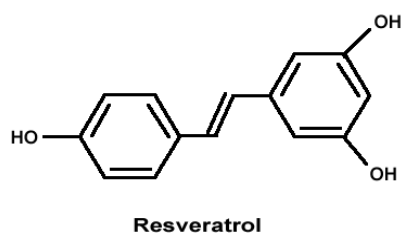
Stem Juice: 10-20 ml twice a day.

Stem powder/churna: 3-6 gms twice a day.

### Chemical Constituents

Phytochemical studies on methanol extract revealed the presence of triterpenes including  $\alpha$ - and  $\beta$ - amyryns,  $\beta$ -sitosterol, ketosteroids, phenols, tannins, carotene and vitamin C. Seven alicyclic lipids constituents have also been reported from *Cissus quadrangularis*. unsymmetric tetracyclic triterpenoids such as d-amyryn, onocer-7-ene-3a, 21b-diol, d-amyrone and 3,3',4,4'-tetra hydroxy biphenyl, 3,3',4,4'-tetrahydroxybiphenyl have been isolated from plant and were quantitatively determined by HPTLC and HPLC methods in samples collected from five different geographic zones of India. Several other constituents such as flavonoids quercetin and kaempferol, and stilbene derivatives, quadrangularins A,B,C and many others e.g. resveratrol, piceatanon, pallidol, perthenocissi and phyto-sterols have been isolated from plant. Stem extract contains a high percentage of calcium ions and phosphorus, both essential for bone growth [15].





## Pharmacological uses

### Antioxidant and free radical scavenging activity

Methanol extract of *Cissus quadrangularis* exhibits strong antioxidant and free radical scavenging activity in vitro and *in vivo* systems mainly due to the presence of  $\beta$ -carotene [5].

### Anti-microbial and antibacterial activity

Methanol extract (90%) and dichloromethane extract of stems possess antibacterial activity against *S. aureus*, *E. coli*, and *P. aeruginosa* and mutagenicity against *Salmonella* microsome. Antimicrobial activity has also been reported from stem and root extract. The alcoholic extract of aerial part was found to possess antiprotozoal activity against *Entamoeba histolytica*. Alcoholic extract of the stem showed activity against *E. coli*. Methanol and dichloromethane extract of whole plant were screened for *in vitro* antiplasmodial activity [13].

### Bone healing activity:

Paste of alcoholic extract of the plant was used locally as well as intramuscularly that facilitates rapid healing of fracture in albino rats. Ethanol extract (95%) enhances the development of cortical bone and trabeculae in foetal femur, which may be related to rich content of calcium, phosphorous and phytoestrogenic steroids and shown to influence early regeneration and quick mineralization of bone fracture healing process.

Ethanol extract (95%) of whole plant possess antiosteoporotic activity in ovariectomized rat model of osteoporosis at two different dose levels of 500 and 750 mg per kg per weight [12].

### Anti-ulcer activity

Methanol extract showed significant antiulcer activity in experimentally induced ulcer in rat model by decreasing gastric secretions and by enhancing glycoprotein levels.

Methanol extract produce healing effect on aspirin induced gastric mucosal damage in rats through its antioxidative mechanism. Triterpenoids and  $\beta$ -sitosterol present in methanol extract possess anti-lipid peroxidating effect and thus prevent gastric damage [25].

### Analgesic, anti-inflammatory and stimulatory activity

Methanol extract possess analgesic, anti-inflammatory and venotonic effects associated with haemorrhoids, anti-inflammatory activity is due to flavonoids especially luteolin and by  $\beta$ -sitosterol.

$\beta$ -sitosterol present in methanol extract has ability to reduce the enzymes MPO indicating a reduction of neutrophils influx in the inflamed tissue. Ethanol extract exhibit protective effect on neutrophils mediated tissue injury induced by aspirin in rats 34. Methanol extract (90%) and dichloromethane extract

of stems possess anti-inflammatory activity against COX-2. The stimulatory effect of extract is probably due to vitamins and is greater than that of the anabolic hormone durabolin [3].

### Central nervous system activity

The root extract possess central nervous system depressant activity indicated by decrease in exploratory behaviour. Methanol extract of roots contains saponins which show potent sedative activity and also inhibit spontaneous motor activity in mice [11].

### Miscellaneous activity

Acetone and dichloromethane extract of the plant possess proteolytic activity against cysteine protease. Extract of the plant have wound healing activity and molluscicidal activity. The extract of plant exhibits cardiotoxic and androgenic property. Ethanol extract (50%) of aerial parts possess hypotensive activity and stem extract possess diuretic activity. The plant formulation is used in the management of weight loss, metabolic syndrome and cardiovascular problems [21].

### Antihemorrhoidal Activity

As the combination of flavonoids (90% diosmin and 10% hesperidin) used clinically for the treatment of haemorrhoid was reported to have anti-inflammatory and analgesic activities as well as venotonic effect which is not reported previously. Phytochemical study of *C. quadrangularis* revealed that its major compounds are flavonoids.

The bioflavonoids, particularly diosmin, hesperidin and oligomeric proanthocyanidin complexes have demonstrated potential in the treatment of haemorrhoids and varicose veins. These bioflavonoids exhibit phlebotonic activity, vasculoprotective effects and antagonistic effect on the biochemical mediators of inflammation. The anti-inflammatory effect which is already been observed from the crude extract of *C. quadrangularis* could be produced by the flavonoids especially luteolin, and by  $\beta$ -sitosterol.

The venotonic effect of *C. quadrangularis* may also be postulated to be due to the effect of flavonoids present in the extract which act in the same way as that of diosmin and hesperidin. As diosmin and hesperidin are used in combination to treat haemorrhoid, the extract which produced the same activities (anti-inflammatory and venotonic) can also be used as Antihemorrhoidal drug. Besides these effects, *C. quadrangularis* also possesses analgesic effect, which can be very useful in painful haemorrhoid [16].

### Gastro protective Activity

*Cissus quadrangularis* is well known for the treatment of gastric disorders in traditional medicine, owing to its rich

source of carotenoids, triterpenoids and ascorbic acid, and has received considerable attention regarding its role in human nutrition.

A number of studies have analysed and revealed the effect against gastric toxicity and the gastro protective effect of *Cissus quadrangularis* extract (CQE) along with its mechanism underlying the therapeutic action against the gastric mucosal damage induced by aspirin.

The studies have investigated the effect of CQE on the course of experimentally induced gastric ulcer by analyzing the levels of tumour necrosis factor- $\alpha$  (TNF- $\alpha$ ), interleukins, micro vascular permeability, activity of nitric oxide synthase-2 (NOS-2), mitochondrial antioxidants, lipid per oxidation and DNA damage.

In addition, the findings of the studies have shown that administration of aspirin increases lipid per oxidation status, xanthine oxidase (XO), myeloperoxidase and decrease in superoxide dismutase (SOD), catalase (CAT) and selenium–glutathione peroxidase activities in the gastric mucosa, resulting in mucosal damage at both cellular and sub cellular level which were reversed by CQE.

In addition, CQE prevents oxidative damage of DNA by reducing DNA fragmentation indicating its block on cell death. Pre-treatment with CQE ameliorated the observed effect significantly in the gastric mucosa of ulcerated rats. <sup>(27)</sup>

### Conclusion

In recent years, ethnobotanical and traditional uses of natural compounds, especially of plant origin received much attention as they are well tested for their efficacy and generally believed to be safe for human use. They obviously deserve scrutiny on modern scientific lines such as phytochemical investigation, biological evaluation on experimental animal models, toxicity studies, investigation of molecular mechanism of action of isolated phytoprinciples and their clinical trials.

It is a best classical approach in of new lead molecules for management of various diseases. Our thorough screening of literature available on *Cissus quadrangularis* depicted an interesting fact that though the plant is a popular remedy for a variety of ailments and a range of formulations has been marketed, little effort have been made to verify its purity, quality and efficacy through scientific screening.

In future study, the isolated principles from *Cissus quadrangularis* needs to be evaluated in scientific manner using specific experimental animal models and clinical trials to understand the molecular mechanism of action, in search of lead molecule from natural resources.

Traditional recipes for treatment of physical and mental ailments exist in all major ancient civilizations of the world. Needless to mention that the root and stem extracts of the plant *Cissus quadrangularis* have therapeutic efficacy and are known to possess wound healing, antioxidant, antimicrobial activity, and are routinely used to accelerate the process of bone fracture healing.

The plant is considered as a versatile medicinal plant in both Ayurvedic and modern drug development areas for its valuable medicinal uses. It is a very rich source of some minerals, which are necessary for proper functioning of human body.

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