



## A Comprehensive Review on *Harbhanga*: A Myth Or Certitude

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### ABSTRACT

Since the ancient time, mankind have used plants as a natural source of treatments and cures. Medical herbs, in particular, have become more popular due to their widespread use and absence of side effects. There is a greater emphasis on plant study across the world, and large body of data has been gathered to demonstrate the enormous potential of medicinal plants employed in many traditional systems. During the previous five years, over 15000 plants have been researched. Recently, scientists have begun to develop a new generation of medicinal remedies employing these renewable resources. Despite the availability of numerous synthetic chemicals, the most effective medications are directly or indirectly linked to the plant world. Many extracts of plants have been shown pharmacological effects. Bone fracture healing, antibacterial, antifungal, antioxidant, anthelmintic, antihemorrhoidal, and analgesic actions have been documented in *Cissus quadrangularis*, perennial climber commonly employed in traditional Indian systems. It is a rich source of carotenoids, triterpenoids, and ascorbic acid, has been shown to have medicinal benefits, including "Gastroprotective action" in combination with NSAID treatment and "Lipid metabolism and oxidative stress." In terms of healing of bone fracture, this review paper addresses some phytochemical and pharmacological characteristics of *Cissus quadrangularis* Linn.

**Keywords:** *Cissus quadrangularis*. Traditional medicine. Carotenoid. Triterpenoids

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### INTRODUCTION

*Cissus quadrangularis* (Linn) is well known as "Hadjod" in India and has been utilised by ordinary people to promote fracture healing. It also goes by the name *Vitis quadrangularis* Wall is a plant that grows in a quadrangular shape. This is a family of Vitaceae. It's a widespread perennial climber that may be found in a wide range of habitats. It's found all across India, but especially in the tropical regions. Vajravalli is the name given to the plant in Sanskrit, Harbhanga in Assamese, Hadjod in Hindi, Kandvel in Marathi, Haddjor in Punjabi, Hadbhanga in oria, Nalleru in Telegu and Edible Stemmed vine in English(1).

### Classification

Kingdom : Plantae

Division : Magnoliophyta

Class : Magnoliopsida

Order : Vitales

Family : Vitaceae

Genus : *Cissus*

Species : *quadrangularis*

*C. quadrangularis* is a shrub having four winged internodes and a thin, fleshy fibrous, smooth stem. This plant's stem and root have antioxidant and antibacterial properties. Anabolic steroidal compounds, calcium, and phosphorus are abundant in *C. quadrangularis* (3). Since ancient times, preparations from the stem of this plant have been widely utilised for the early mending of fractures, gout, back discomfort, and irregular menstruation. The steroidal compounds found in *C. quadrangularis* have a significant impact on the pace of fracture healing and callus mineralization (2, 4).

Ethnopharmacological effect of *Cissus quadrangularis*: Bone fractures, gastritis, skin infection, constipation, eye problems, piles, and anaemia have all been treated traditionally. The alternatives such as leaves and young shoots are effective for Asthma, burns, irregular menstruation and wounds. Bowl ailments are treated with powder for haemorrhoids, and stem juice is also helpful. However, a stem paste boiled in lime

water is offered in cases of asthma, irregular mens truation, and scurvy. It's also a potent stomachic. *Cissus quadrangularis* has the ability to repair fractures effectively, antibacterial, antiulcer, antioxidative properties, cholinergic action, antiosteoporotic, gastroprotective as well as anti-inflammatory and anti-cancer properties (5, 6).

Phytochemicals in *Cissus quadrangularis*: The existence of several versatile elements such as flavanoids, Vitamin C, triterpenoids, stilbene derivatives, and many more such as resveratrol, pallidol perthenocissin, piceatannol, and phytosterols, has been discovered in phytochemical investigations of *Cissus quadrangularis*. The primary ingredients of this plant were discovered as ketosteroid, ascorbic acid, two asymmetrical tetracyclic triterpenoids, triterpene and calcium (7, 8)

Toxicological Review: *Cissus quadrangularis* have not cause any dose-related changes in haematological parameters of serum clinical chemistry, and no histopathological lesion of any internal organ was discovered that may be linked to *Cissus quadrangularis*' harmful impact(9). This review mainly shows the healing of bone fracture of the plant *Cissus quadrangularis*.

### TRADITIONAL CLAIM: A MYTH

*Cissus quadrangularis* is an Asian and African succulent vine. It is one among Thailand's most widely utilised medicinal herbs. It has a long history of usage in both African and Ayurvedic medicine. Medicine may be made from any component of the plant. *Cissus quadrangularis* is a traditional medicine that is typically associated with Ayurveda, however it appears to have been utilised medicinally in a variety of places due to its widespread distribution. It was traditionally used to treat female disorders like menopause, libido, and menstrual disorders as well as bone disorders (increasing bone mass or accelerating fracture healing rates), earning it the nickname "Bone Setter" ("*Hadjod*"). Other traditional uses include its supposed antiulcer properties, antihemorrhoid properties, pain relieving properties, and wound healing properties.

### Traditional uses of the plant in Ayurveda

- Asthiyuk -strengthens bones
- Sara -induces mobility, causes diarrhea, 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

Obesity, syphilis, leucorrhoea, worm infestation, gout, anorexia, diabetes, peptic ulcer, haemorrhoids, and excessive cholesterol are some of the conditions for which it is used. It's also a popular supplement for bodybuilders. Its stem is used as a vegetable in India's northeastern states. It is used in the Siddha system of medicine to treat bone fractures, piles, as an anti-aging herb, and for the treatment of Asthma, cough, and gonorrhoea. The stem of the *Cissus quadrangularis* is cooked in ghee and mixed with milk to cure wounds, fractures, and osteoarthritis. Traditional healers in Kerala administer the paste on cracked or dislocated joints. Its soup is often used to speed up the mending of broken bones. In Southern India, the plant's stems are consumed as a pickle to strengthen bones and repair epithelial cell damage in cell injury. In Unani system of medicine the powder root of *Cissus quadrangularis* is used for the fractures of bones, with the same effects as plasters externally (14).

### SCIENTIFIC ASPECTS OF *HARBHONGA*: A CERTITUDE

(Deka K. D et al., 1994) reported that the influence of methanolic extract of *Cissus quadrangularis* Linn (CQ) on the healing process of artificially damaged radius-ulna of dogs revealed earlier beginning of healing than control animals. This was shown using radiographic and histological examinations. Additionally, the serum calcium levels of the treatment group decreased more than those of the control group. The treated animals' healing was nearly complete on day 21 following the fracture, but the control animals' healing was still not complete. Neither group's blood calcium levels had significantly changed by day 21 following the fracture. (4). (Potu K. B et al., 2009) stated that the most common metabolic bone disease is postmenopausal osteoporosis, which is characterised by a fast loss of mineralized bone tissue. It was examined how a petroleum-ether extract of *Cissus quadrangularis* Linn. (CQ) might affect a rat model for osteoporosis brought on by ovariectomy. The weight gain in the femur was evidence that the petroleum-ether extract of CQ reduced bone loss. It also suppressed osteoclastic activity, allowing bone synthesis to occur. ALP staining in the femur slice was used to quantify bone formation, while TRAP staining was used to show osteoclastic activity. The discovery that CQ affects both enzymes raises the possibility that it could be used to treat and prevent postmenopausal osteoporosis.(10). (Soumya S et al., 2012) stated that by lyophilizing *Cissus quadrangularis* (CQ) extract with natural biopolymers alginate (Alg) and O-carboxymethyl chitosan (O-CMC), a unique "herbal scaffold" (Alg/O-CMC/CQ-E scaffold) was created. Scanning electron microscopy, Fourier transform infrared spectroscopy and X-ray diffraction analyses used to evaluate the

composite scaffolds. The biocompatibility of the composite scaffolds is supported by preliminary cytocompatibility experiments with human mesenchymal stem cells (hMSCs). When compared, there was a substantial difference in early cell adhesion and proliferation. Furthermore, the hybrid scaffold favoured a significant increase in hMSC differentiation to osteoblasts. As a result, this osteoinductive scaffold might be a suitable option for bone tissue engineering treatments(11). (Banu J et al., 2012) stated that Osteoporosis is caused by women losing a lot of bone during and after menopause. Existing treatments mostly inhibit bone resorption. *Cissus quadrangularis*(CQ), was studied in C57BL/6 mice to see how it affected bone loss following ovariectomy. After eleven weeks, mice were killed, and the long bones were scanned using pQCT and CT. Contrarily, CQ-fed mice did not significantly differ in trabecular number, thickness, or connectivity density between Sham and OVX mice, with the exception of cortical bone mineral content in the proximal tibia. Control mice had less cancellous and cortical bone in the distal femoral metaphysis, femoral diaphysis, and proximal tibia.(1). (Samaranayake TDCL et al., 2020) stated that *Cissus quadrangularis*, known as Devil's Backbone, is a perennial plant. According to Ayurveda and traditional medicine, it is used alone or in various formulations with other medicaments. *C. quadrangularis* contains Madhura (sweet) Rasa (taste); Laghu (easily digested) and Ruksha (dry) Guna (quality); Amla Vipaka (sour after digestion) and Ushna Virya (sour after digestion) (hot in potency). It also contains Kaphavatashamaka (Kapha and Vata Dosha mitigation) and Pittavardhaka (Pitta Dosha aggravation) qualities. *C. quadrangularis* is also used in fracture repair, osteoarthritis, traumatic oedema, cracked heels, Gonorrhoea, diarrhoea, haemorrhoids, bronchial asthma, urine retention, ailments caused by the Kapha and Vata Doshas, infertility etc. This is commonly utilised in orthopaedic therapy in Sri Lankan traditional medicine, particularly in the healing of fractures(12). *Cissus quadrangularis* Linn. aids in the healing of shattered bones. It takes a considerable time for a fracture of the maxillofacial skeleton to heal. Up to the present, numerous attempts have been made to shorten the 6–8 week healing time, either through improved surgical technique or through inhibiting the physiological process of bone mending. As part of their postoperative care, all of the patients had open reduction internal fixation and received antibiotics and painkillers. Comparing the experimental group to the control group, the results revealed increased serum calcium and phosphorus levels and evidence of bone healing. *C. quadrangularis* expedites the healing of broken jaw bones and lessens pain, edema, and fracture mobility.(13). *Cissus quadrangularis*, a member of the Vitaceae family, is used in Ayurveda for a variety of purposes including Pachana (digestive help), Sara (relieves constipation), Athiyuk (bone strengthening), Vrushya (aphrodisiac), and others. The entire plant is used to cure asthma, while the powdered root is used to heal bone fractures. In addition to leaves and young shoots, gastro intestinal therapies include leaves and young shoots. In otorrhoea, the stem juice is poured into the ear, while in epistaxis, it is poured into the nose(14). Plant-based medicines lower production and cost benefits may allow more money to be invested in research and development of novel therapies, allowing patients to get new medications faster. Bone fracture healing, antibacterial, antifungal, antioxidant, anthelmintic, antihemorrhoidal, and analgesic actions have been documented in *Cissus quadrangularis*, a perennial climber commonly employed in traditional Indian medical systems. The plant is a rich source of carotenoids, triterpenoids, and ascorbic acid, has been shown to have medicinal benefits, including "Gastroprotective action" in combination with NSAID treatment and "Lipid metabolism and oxidative stress"(15). (Shirwaikar A et al., 2003) stated that an ovariectomized rat model of osteoporosis, an ethanol extract of *Cissus quadrangularis* was tested for anti-osteoporotic efficacy. The findings, which were evaluated using biomechanical, biochemical, and histological criteria, revealed that the plant's ethanol extract had a clear antiosteoporotic effect(16). (Stohs J. S et al., 2013) stated that extracts and powders from *Cissus quadrangularis* have been used as anabolics, analgesics, to treat infections, to enhance bone and tissue healing, and to help with weight loss and management. *Cissus* extracts have been proven to aid in weight loss in a number of human investigations. No studies have been done to support the anabolic and muscle-building capabilities of *Cissus*. At the usual doses, *cissus* extracts seem to be extremely risk-free and symptom-free. From *Cissus* preparations, chemicals such as steroids, flavonoids, stilbenes, iridoids, triterpenes, and derivatives of gallic acid have been isolated and identified.(17).

## DISCUSSION

Considering the fact that the plant "*Harbhanga*", is by myth a very potential plant, which acts as an effective calcium ions releaser and based on this traditional belief, different scientists have carried out various scientific researches and found that the effect of methanol extract of the "*Harbhanga*" plant on healing process of artificially fractured radius-ulna in dogs has proved to be highly operative. The most common metabolic bone disease, postmenopausal osteoporosis is characterized by a fast loss of mineralized bone tissue. An increase in the osteoblastic activity in *Cissus quadrangularis* ("*Harbhanga*"), treated animal during fracture repair has also been reported in scientific literatures. According to Ayurveda and Traditional systems of medicine, *Cissus quadrangularis* has been practiced in the healing of damaged bones.

Further, the entire plant *C. quadrangularis* has shown free radical scavenging, antiulcer, analgesic, antipyretic, antihyperlipidemic, antimicrobial, antiarthritic and antitumor activities. Due to various pharmacognostic properties, it is recommended as a supplementary drug to aid in healing of fractures (13). This is extensively used as a Sri Lankan traditional medicine for fracture repair in orthopaedic therapy. Osteoporosis is caused in women losing a lot of bone during and after menopause. The entire plant is useful to heal asthma, while the powdered roots are used to heal bone fractures. This perennial climber is commonly employed in traditional Indian medical systems. The plant is recognised as a potent medicinal plant by both folklore, in traditional as well modern systems of medicine and has established as a certitude for its medicinal uses, besides it is a rich source of some minerals, which are necessary for proper functioning of body as well (14). The prospective effects of *Cissus quadrangularis* are due to the presence of polyphenols and it reduces bone reabsorption by down regulating pro-inflammatory cytokines. Nourishment enrichment is a significant factor for bone healing and calcium acts as a strong mineral substance, which helps in healing of bones, but only morphology of calcium uptake needs to be understood if it is in the ionic state or in the crystalline morphology as only increased intake of calcium would not progressively recover the rate of new bone formation, but, its ability for absorption as well as utilization of should be well penetrable enough for the accelerating the healing process, stimulated by improved absorption of other minerals such as sulfur, strontium, and amino acids like lysine (24).

## CONCLUSION

Traditional remedies for treating physical and mental disorders may be found in all of the world's major ancient civilizations. It goes without saying that *Cissus quadrangularis* root and stem extracts have medicinal value, are known to have antioxidant and antibacterial action, and are commonly used to speed up the healing process of bone fractures. The plant is recognized as a versatile medicinal plant in both the domains of modern drug research and Ayurvedic medicine because of its therapeutic uses. It is a high source of minerals that are required for the correct functioning of the human body. According to this review, it can be concluded that *C. quadrangularis* is indicated as a supplemental medicine to help in the healing of fractures.

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