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## A Comprehensive Review on the Medicinal Properties of *Cissus quadrangularis*

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### ABSTRACT

The plants *Cissus quadrangularis* have been used in traditional medicine for many years to promote bone and tissues healing, it was also used as antioxidant, for healing of gastric ulcers and several other ailments. This review was an attempt to summarize various animal and human studies and in vitromodels that have been conducted to determine the efficiency and safety of this plant as a medicament.

### KEYWORDS

*Cissus quadrangularis*, Bone Healing, Ayurvedic, Hadjod



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## INTRODUCTION

*Cissus quadrangularis* is an indigenous plant used in ayurvedic medicine. It was commonly known as *Asthisamhari*, an adamant creeper found throughout the hotter parts of India. The plant is fleshy cactus in nature, and are also known as *Vitis quadrangularis*, *Helitropium indicum*, or *Lycopodium imbricatum*. In Ayurveda it is used as a digestive aid (*Pachana*) and mainly used for strengthening of bones (*Athiyuk*). In Unani, it is used to treat gastritis.<sup>1</sup> The plant is known as *Harishankar* or *Hadjod* in Hindi and *Asthisanghata*, *Kandavalli*, *Vajrangi*, etc., in Sanskrit. *Hadjod* means that which joins the bones.<sup>2,3</sup> The plant parts such as stems, leaves, roots were reported to possess medicinal properties. The present review will possibly help to bridge between traditional claims and modern therapy on *Cissus quadrangularis* and to understand its unexplored potential.

## TRADITIONAL USES

The root and stems of *Cissus quadrangularis* were found to have unique healing property for bone fractures. The stem is bitter in taste; used systematically and applied topically in broken bones and for muscular pain<sup>4, 5</sup>. The plant has also been documented in Ayurveda for the treatment of osteoarthritis, rheumatoid

arthritis and osteoporosis<sup>6,7</sup>. The stem juice of *C quadrangularis* is used to treat scurvy, menstrual disorders, otorrhoea and epistaxis<sup>5</sup>. The sap along with tamarind has been reported for the treatment of gonorrhoea in East Africa<sup>8</sup>. The herb is fed to cattle to induce flow of milk. The ash of plant is useful as a substitute for baking powder<sup>5</sup>. The stem of the plant is useful in the treatment of asthma, burn wounds, bites of poisonous insects and for saddle sores of horse and camels<sup>5,9</sup>. The plant decoction with dry ginger and black pepper is given for body pain and the infusion of plant is reported to be anthelmintic<sup>5</sup>. The leaves and young shoots are powerful alternatives, when dried and powdered they are administered for certain bowel infections connected with indigestion. The plant was beneficial for several other conditions like helminthiasis, anorexia, dyspepsia, leprosy, hemorrhage, tumors, chronic ulcers and swellings. The fleshy skin has been prepared for treatment of gastritis, constipation, eye disease, piles and anemia<sup>10,11</sup>.

## PHARMACOLOGICAL USES

The folk and traditional uses of the plant reported were scientifically investigated through animal model. This validates the pharmacological potential of the plant and its cure towards variety of ailments.



## ANTIOXIDANT AND FREE RADICAL SCAVENGING ACTIVITY

The stem part of *Cissus quadrangularis* Linn contain vitamin 'C', carotenoide, calcium, steroid. and these are known to be excellent antioxidants. Numerous studies have reported that dietary intake of plant polyphenol antioxidant may have positive effect in oxidative stress related pathogenesis, hence the extract of *C. quadrangularis* were tested for Antioxidant activity by  $\beta$ - carotene linolenic acid model<sup>12,13</sup>.

## ANTIMICROBIAL 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*<sup>1</sup>. Antimicrobial activity has also been reported from stem and root extract of *C quadrangularis*<sup>12</sup>. The alcoholic extract of aerial part was found to possess anti-protozoal activity against *Entamoeba histolytica*<sup>15</sup>. Alcoholic extract of the stem showed activity against *E. coli*<sup>16</sup>. Methanol and dichloromethane extract of whole plant were screened for *in vitro anti-plasmodial activity*.

## BONE HEALING ACTIVITY

Paste derived from the alcoholic extract of the plant was used both locally as well as

intramuscularly, which resulted in rapid healing of fracture in albino rats<sup>17</sup>. Ethanol extract (95%) enhances the development of cortical bone and trabeculae in fetal femur, which was related to rich content of calcium, phosphorous and phytoestrogenic steroids and shown to influence early regeneration and quick mineralization of bone fracture healing process<sup>18</sup>. The plant also possess anti-osteoporotic activity which was analyzed in ovariectomized rat model with osteoporosis<sup>19</sup>. Deka DK et al 1994, reported that the extract of *C. quadrangularis* is used widely for fracture repairs at its earlier stages since ancient times. He conducted an animal study on eight healthy dogs with experimentally fractured radius and ulna bones. At the end of 11<sup>th</sup> day, the bony dissolution and periosteal reaction were seen radiographically in *Cissus* group. After 21 days of trial radiograph showed an increase in bony deposition and periosteal reaction than the control groups<sup>20</sup>.

In a similar study Singh et al 2011 checked the fracture healing in 44 patients and compared the osteogenic potential of *C quadrangularis*, *Moringaoleifera*, and *Osteoseal*. They analyzed the serum calcium, phosphorus levels and radiographs at different time intervals. It was concluded that the osteogenic activity was higher in



osteoseal followed by *C. quadrangularis* with a 2 week delay in healing<sup>21</sup>.

This healing property is said to be due to the presence of Steroidal substance in the plant that influences the rate of healing and quicker mineralization of callus. *C. quadrangularis* acts by increasing the metabolism and uptake of the minerals calcium, sulfur, and strontium by the osteoblasts in fracture healing. Certain amino acids such as lysine help in absorption of calcium. *Cissus* also contains Vitamin A and C that is effective in the formation of collagen. It was also reported to have an inhibitory effect on anti-anabolic property of steroid such as cortisone thus stimulating the cells of mesenchymal origin, such as fibroblasts, chondroblasts and osteoblasts. These cells have a greater impact on cellular proliferation of osteoblast than other cellular cycles<sup>2,20,22</sup>.

#### ANTI-ULCER ACTIVITY

*Cissus quadrangularis* an indigenous plant commonly mentioned in Ayurveda for treatment of gastric ulcers. The ulcer-protective effect of a methanolic extract of *Cissus quadrangularis* was said to be equivalent to that of standard drug sucralfate. Further experimental animal studies on gastric mucosa showed that *Cissus* at a dose of 500 mg/kg given for a period of 10 days significantly increased the mucosal defensive factors like mucin

secretion, mucosal cell proliferation, and the life span of cells. The above investigation suggests that the plant extract increases the gastric mucosal resistance and promotes healing by inducing cellular proliferation thus providing anti-ulcer activity<sup>23</sup>. This antiulcer activity is proved experimentally in ulcer induced rat models, where the plant methanolic extract acts by decreasing gastric secretions and by enhancing glycoprotein levels<sup>18</sup>. Thus Methanol extract produce healing effect on aspirin induced gastric mucosal damage in rats through its antioxidative mechanism<sup>13</sup>. Triterpenoids Beta sitosterol present in methanol extract possess anti-lipid peroxidating effect and thus prevent gastric damage<sup>2</sup>.

#### GASTRO PROTECTIVE ACTIVITY

*C. quadrangularis* *L.* is rich source of arytenoids, triterpenoides and ascorbic acid, which plays an important role in human nutrition. Many studies have analyzed and revealed the effects against gastric toxicity and gastro protective effect of *C. quadrangularis* against the gastric mucosal damages induce by aspirin.

The studies show that administration of aspirin increased lipid peroxidation status, xanthenes oxides, myeloperoxidase in gastric mucosa, resulting in mucosal damages at both cellular level and sub



cellular level which were reversed by anti lipid peroxidative effect present in *C. quadrangularis* extract<sup>25</sup>.

### **ANALGESIC, ANTI-INFLAMMATORY AND STIMULATORY ACTIVITY**

The Methanol extract of the plant, due to the presence of flavonoids especially luteolin and  $\beta$ -sitosterol possess analgesic, anti-inflammatory and venotonic effects associated with hemorrhoids, anti-inflammatory activity<sup>26</sup>.  $\beta$ -sitosterol present in methanol extract has ability to reduce the enzymes MPO indicating a reduction of neutrophils influx in the inflamed tissue<sup>27</sup>. Calcium oxalate, carotene, tetraterpenoids,  $\beta$ -sitosterol, amyirin and anabolic ketosteroids present in the plant extract were responsible for acceleration of healing, anti-inflammatory and analgesic activity<sup>17,28</sup>. The Ethanol extract exhibit protective effect on neutrophils mediated tissue injury induced by aspirin in rats. Methanol extract (90%) and dichloromethane extract of stems possess anti-inflammatory activity against COX-2<sup>1</sup>. The stimulatory effect of extract is probably due to vitamins and is greater than that of the anabolic hormone durabolin<sup>17</sup>.

Flavanoids inhibits the inflammatory process by blocking the lipo-oxygenase enzymes especially the luteolin, which is a known compound of *C. quadrangularis*.

The anti-inflammatory activity of  $\beta$ -sitosterol was demonstrated to have an inhibitory effect on edema induced by arachidonic acid. Hence it was suggested that *C. quadrangularis* L. is dual inhibitor of arachidonic acid metabolism<sup>29</sup>.

### **CENTRAL NERVOUS SYSTEM ACTIVITY**

The root extract possess central nervous system depressant activity indicated by decrease in exploratory behavior<sup>30</sup>. Methanol extract of roots contains saponins which show potent sedative activity and also inhibit spontaneous motor activity in mice<sup>31</sup>.

### **MISCELLANEOUS ACTIVITY**

*C. quadrangularis* extract has varied miscellaneous properties. The decoction of the shoots with dry ginger and black pepper is given for body pains. The infusion of the plant is anthelmintic. The extract also exhibit cardio tonic property. Young shoots are used in dyspepsia and indigestion. The powdered stem mixed with pulses and sesame oil was used as a remedy for several 'vata' diseases. It is also used in skin diseases Leprosy, Cough, Epilepsy and Convulsions.

Acetone and dichloromethane extract of plant possess proteolytic activity against cystine protease<sup>6</sup>. 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<sup>33</sup>.

### **TOXICOLOGY**

The *Cissus Quadrangularis* extract does not cause toxic effect on oral administration (1mg/Kg daily for 10 days) in mice, rats and guinea pigs. However, on intravenous administration, the animals developed convulsions and died in five minutes. The MLD worked out to be 15.5 mg/Kg in guinea pigs. Toxic evaluation reports that the drug is safe even at higher dosage for a prolonged period of time<sup>3</sup>.

### **CONCLUSION**

*C. quadrangularis* has drawn much attention nowadays for its medicinal uses because of its efficacy and safety for human use. The plant is considered as a versatile medicinal plant in both Ayurvedic and modern drug development areas for its valuable medicinal uses. It does not produce any toxic effects when used orally and due to its various inherent pharmacognostic properties, *C. quadrangularis* is recommended as a supplementary drug to aid in healing of fractures.



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