Abstract: In Ayurveda, diminution of dhatu has been considered as the most important cause of vitiation / aggrevation vata dosha. Diminution of Asthidhatu causes loss of hair, nails, beard, moustache and teeth, fatigue and laxity of joints. Asthi dhatu kshaya leads to probability of bone fracture, osteoporosis and joint disorders. Asthishosh is feature of asthigata vata. In Ayurveda, there are many herbs that accelerate the fracture healing and prevent senile bone decay. Cissus quadrangularis Linn., Vitaceae (Asthishrinkhala) is reputed herb in traditional system of India medicine. The osteogenic potency of this plant is favourable in the treatment of bone fracture and also in delay and prevention of osteoporosis. Almost all parts like root, stem, leaf are used medicinally. C. Quadrangularis Linn. possess antioxidant, antimicrobial activity and is routinely used to accelerate the process of bone fracture healing, prevents osteoclastic activity, relieves pain and inflammation, increase bone mineral density, rapidly increase bone tensile strength which leads to faster recovery. The plant is considered as a versatile medicinal plant in both Ayurvedic and modern drug development areas for its valuable medicinal uses.

Keywords: Asthidhatu kshaya, Asthishrinkhala, Anti-inflammatory, Anti-oxidant, Fracture healing properties, Osteoclastic activity.

Introduction: Asthishrinkhala (Cissus quadrangularis Linn. or Vitis quadrangularis, Family-Vitaceae) commonly known as “Hadjhod” has been used in Ayurveda since the time of Shodhal. Plant is beneficial for healing of the fracture of bone and useful in treatment of Osteoarthritis, Rheumatoid arthritis and osteoporosis. It is a common perennial climber distributed throughout India, particularly in tropical regions.

According Ayurveda, vata is aggrevated due to diminution of dhatu. Diminution of Asthi leads to is falling of hair, nails, beard, moustache and teeth, fatigue and laxity of joints (Kesha, loma, nakha, shramashu, dwij prapatanam, Sandhi saithilya). Sequence of dhatu formation described by Acharya Charaka states that previous dhatu nourishes the later in the series of saptadhatu viz. rasa, rakta, mansa, meda, asthi, majja, shukra. From birth to death and right from the moment of conception, into the extreme old age, the human body undergoes considerable changes in shape, size and composition.
Pharmacological Properties

**Classical (Rasapanchaka)**

**Rasa- Madhura**

**Guna - Laghu, Ruksa**

**Vipaka- Madhura**

**Vira - Ushna**

- Kapha-vata shamak, pitta vardhak

**Classical uses:** Dipana (appetiser), Pachaka (digestant), Raktashodhaka (blood purifier), Raktastambhaka (arrests bleeding), Bhagnasandhanak (bone fracture healing), Krimighna (anthelmintic), Arshoghna (cure piles), Akshirogajit (used in ophthalmic disease), vrishya (aphrodisiac) [5].

**Pharmacological Activity:** Anti-inflammatory, Anti-osteoporotic, Anti-jaundice, Anti-ulcerative, Anti-oxidant and free radical scavenging properties, Anti microbial, Anti bacterial, bone healing activity, Parasympathetic activity [9].

**Anti inflammatory and Analgesic Properties:** Flavonoids have inhibitory effect on the inflammatory process. They inhibit lipoxygenase, especially luteolin. Anti-inflammatory activity of β-sitosterol was demonstrated to have an inhibitory effect on edema induced by both carrageens and arachidonic acid. It is suggested that *C. quadrangularis* is dual inhibitor of arachidonic acid metabolism [9].

**Anti Osteoporotic Activity:** *C. quadrangularis* has been reported in Ayurveda for its anti osteoporotic activity. Phyto-estrogen rich fraction (IND- HE) from the aerial parts of plant shows this activity. Phytoestrogen steroids isolated show influence on early regeneration and quick mineralization of bone. Ethanolic and petroleum ether extract of *C. quadrangularis* shows prominent effect. Various studies confirm anti-osteoporotic activity. Phytoestrogen rich fraction (IND- HE) of *C. quadrangularis* increased blood calcium level, Vit D3, serum estrogen, bone mineral density and bone mineral content. There is significant increase in bone thickness, bone density and bone hardness. It also significantly inhibits the anti anabolic effect and exerts some beneficial effect on recovery of bone mineral density. The ethanolic extract of *C. quadrangularis* shows definite anti-osteoporotic effect [9].

**Bone Healing Activity:** The anabolic steroid principle from *C. quadrangularis* showed marked influenced on rate of fracture healing by influencing early regeneration of all connective tissue involved in the healing and quicker mineralization of callus [9]. Its systemic use in rats caused complete restoration of normal composition of bone after four weeks of fracture. All events namely fibroblastic phase (1st week),

It contains high amount of carotene-A, anabolic steroidal substances, mucopolysaccharides. The plant contains ascorbic acid, 479 mg and carotene 267 mg per 100 gm freshly prepared paste in addition to calcium oxalate. The root powder is rich source of mineral elements (mg/100 g dry matter): potassium 67.5; calcium 39.5, zinc 3.0, sodium 22.5, Iron 7.5, lead 3.5, cadmium 0.25, copper 0.5 and magnesium 1.15. Air dried plant contain moisture 13.1, protein 12.8, wax 1.0, fiber 15.6, carbohydrate 36.6, mucilage and pectin 1.2 and ash 18.2%.

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### Classical Formulations

1. **Asthisamhara Swaras:** Plant stem juice could be used for *Nasya* (nasal drop purpose) in Epistaxis, for treating worm infestation *vidanga churna* (Powder of *Embelia ribes* Burm.f.) is added and taken twice daily [7].

2. **Asthisamhara Lepa:** The leaves crushed (Paste of leaves) and applies to arrest bleeding in fresh wound due to bone fracture [7].

3. **Asthisamhara Churna:** *Asthishrinkhala, Arjuna* (Terminalia arjuna Roxb.), *Godhuma* (*Triticum sativum* Lam.) *Laksha* - all ingredients taken in equal quantity in fine powder form mixed with *ghrita* taken along with milk in *Asthibhanga chikitsa* [9].

4. **Asthisamhara Taila:** Oil processed with whole plant for local application in treatment of Rheumatoid arthritis and osteoarthritis [4].

**Phytochemistry:** The plant contains various constituents such as flavanoids, triterpenoids, vitamin ‘C’, stilbene derivatives and many others, e.g. resveratrol, piceatannol, palilidol perthenocissin and phytoestrogens. Ascorbic acid triterpene, β-sitosterol, ketosteroid, two asymmetrical tetracyclic triterpenoids and calcium were identified as major constituents of the plant [9].

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collagen (2nd week) and osteochondroital phase (3rd week and 4th week) were hastened about 10-14 days in treatment group. This hastening in the healing was attributed to stimulation of all the cells of mesenchyme origin mainly fibroblast, the chondroblast and osteoblast by *C. quadrangularis*. The plant contains vitamins and steroids, which are found to have specific effect on bone fracture healing. Various studies concluded that *C. quadrangularis* causse less amount of tissue reaction in the fracture region leading to optimum decalcification in early stage with minimum of callus formation; hence deposit of calcium was just enough to joint two broken segments of bones so that its remodelling takes much faster. Plant builds up the chemical composition of fractured bone namely mucopolysacchrides collagen, calcium, phosphorus and other component. Mucopolysacchrides play an important role in healing by supplying raw material at the site for repairing tissue. The *C.quadrangularis* extract may regulate osteoblastic activity by enhancing MAPK (mitogen activated protein kinase)-dependent alkaline phosphatase activity, preferentially via p38 MAPK pathway. *C.quadrangularis* treatment resulted in early calcification and remodelling phenomenon, as calcium level and the tensile strength of newly formed bone were rapidly restored to normal level [10].

**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 produced healing effect on aspirin induced gastric mucosal damage in rats through its anti-oxidative mechanism. Investigations suggested that *C.quadrangularis* not only strengthens mucosal resistance against ulcergens but also promotes healing by inducing cellular proliferation [9].

**Anti Microbial and Anti Bacterial 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 anti protozoal activity against *Entamoeba histolytica* [11].

**Antioxidant and Free Radical Scavenging Properties:** Methanol extract of *C. quadrangularis* exhibits strong antioxidant and free radical scavenging activity in vitro and in vivo systems mainly due to the presence of β-carotene [10].

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

**Conclusion:** *C.quadrangularis* Linn. has therapeutic efficacy and is known to possess antioxidant, antimicrobial activity and are routinely used to accelerate the process of bone fracture healing [12,13], prevent osteoclastogenesis [14], relieve pain and inflammation, [15] increase bone mineral density (BMD) [15], rapidly increase bone tensile strength which leads to faster recovery [12]. The plant is considered as a versatile medicinal plant in both Ayurvedic and modern drug development areas for its valuable medicinal uses.

**References**