

PHARMACOLOGICAL REVIEW OF *CISSUS QUADRANGULARIS LINN* (ASTHISHRINKHALA)

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ABSTRACT

Cissus quadrangularis Linn. is also known as *Asthishrinkala* in traditional system of old Indian medicine. Almost all parts like, Root, Stem, Leaf are most important part used medicinally. Plant possesses many activity like Anti-inflammatory, Antioxidant, Gastro protective activity. Plant is used in worm infestation, bowel disorder, ophthalmic disease. From last few decades research work has been done to prove its biological activities and efficacy of its extract. This review highlights some of the phyto-chemical and pharmacological aspect of plant. It deals with the information describe in Ayurvedic literature, scientific research conduct on different aspect of plant.

Keywords: Asthishrinkhala, Ayurvedic Classification, classical uses, Phytochemical constituents, Pharmacological properties

INTRODUCTION¹

Asthishrinkhala is also known as *Cissus quadrangularis Linn.* (*C. quadrangularis L.*) or *Vitis quadrangularis*. It belongs to family vitaceae. It's a common perennial climber which distributed throughout India particularly in tropical regions. The plant requires warm tropical climate and it survives throughout the year in different seasons. Propagate by stem nodes easily sprouting, seedling for new plant of climbing habit, cutting in the month of June and July. It planted in hedges and boundary walls of gardens, farms and cultivated fields and also in pots. It is climbing herb, tendrils simple, opposite to the leaves, leafless when old.
Botanical Name: - *Cissus quadrangularis*
Family: - Vitaceae

Sanskrit: - Granthiman, Asthisamhari, Vajrangi, Asthishrinkhala.

Classification as mention in Samhita Varga : Guduchyadi varga - Bhavprakash nighantu².

Laxmanadi varga - Shodhal nighantu³⁵.

Macroscopic character³⁴ -

Roots - are aerial, develop during rainy season.

Stem - is buff colored with greenish ting, dichotomously branched, sub-angular, glabrous, fibrous and smooth.

Tendrils - occasionally present at nodes.

Internodes - measures 4-5 cm long and 1-2 cm thick.

Leaves - are simple or lobed, cordate, broadly ovate or reniform, serrate, dentate, sometimes 3-foliolate.

Flowers - are small, greenish white, bisexual, tetramerous, in umbellate cymes, opposite to the leaves. Petals are 4-5, imbricate.

Calyx - is short, entire, deciduous and cup shaped.

Fruit - are globose or obovoid fleshy berries, succulent, very acrid, dark purple to black.

Seeds - are ellipsoid or pyriform, one seeded, flowering and fruiting time - post rain and autumn season.

Microscopic description³⁴ -

Stem - Shows squarish outline with prominent projection at each annular point; epidermis single layered, covered externally with thick cuticle; epidermal cells thin-walled, rectangular and tangentially elongated, followed by 2-3 layers of cork and single layered cork cambium; cortex composed of 8-16 layers of thin-walled, circular to oval parenchymatous cells; four patches of collenchymatous cells present in all the four angular points embedded in cortical region like an umbrella arching over large vascular bundles; in the projected portion of angular region cortical cells filled with brown-red contents present; endodermis not distinct; stele consists of a large number of vascular bundles varying in size arranged in the form of a ring separated by rays of parenchyma; 3-4 vascular bundles larger in size, in each angular region, below collenchymatous patch, while rest of bundles smaller in size; vascular bundles collateral and open type, capped by sclerenchymatous sheath which is well developed in larger bundles; cambium and interfascicular cambium quite distinct; central region occupied by

a wide pith composed of thin-walled, circular to oval parenchymatous cells; idioblasts containing raphides and isolated acicular crystals of calcium oxalate present in the outer region of cortex and also in a number of cells throughout the region; rosette crystals of Calcium Oxalate also found in most of the cells in cortical region; starch grains present throughout the cortical and the pith regions.

Leaf:

Midrib - Keeled on adaxial side, convexly rounded on abaxial side; ground tissue parenchymatous, thin walled cells, those in periphery containing chloroplasts; a small patch of sclerenchyma and below this group of chollenchyma cell in the keel; a ring of 4 to 6 vascular bundles without bundle sheaths; some cell of midribs have druses and raphides, each vascular bundle consists of a centripetal xylem composed of sieve tubes, companion cells and phloem parenchyma with few small cavities dispersed among them.

Lamina - A section through the leaf shows well defined upper and lower epidermis comprised of parenchymatous cell rounded in vertical section and angular in surface view; stomata present on both surface anomocytic; mesophyll of lamina undifferentiated; margin composed of a patch sclerenchyma; stomatal index for upper surface not more than 4 while for lower surface not more than 5.

Powder - Epidermal cells in surface view showing anticlinal division and stomata; fragments consisting of hexagonal parenchymatous cells of ground tissue some showing the presence of crystals of calcium oxalate as druses and raphides;

some fragments having vessels, fiber and starch grain.

Organoleptic character of powder-

Color - Cream color light yellow

Odor - Slightly characteristic.

Taste - Slightly characteristic.

Ayurvedic Properties of Whole plant³⁷

It is a medicinal plant it's been used in Ayurveda since the time of Bhavprakash nighantu written by Acharya Bhavprakash in 16th century,² the plant beneficial for healing the fracture of bone. The plant also documented in Ayurveda for treatment of Osteoarthritis, Rheumatoid arthritis and osteoporosis.

Rasa- Madhura

Guna - Laghu, Ruksha

Vipaka - Madhura

Veerya - Ushna

Doshagnata - kaphavata shamak.

Karma: Dipana(appetiser), Pachaka(digestant), Raktashodhaka (blood purifier), raktastambhaka (arrest bleeding), Bhagna- Ashtibhagna (it uses in bone fracture healing). Krimighna - It eliminates the Krimi (work in worm infestation), Arshoghna - It helps to cure piles. Akshirogajit - It used in ophthalmic disease. Vrushya - It is aphrodisiac.

Classical uses³⁷

It is useful in asthma, the stem ground or beaten into paste and internally used in asthma. , the leaves and stems are frequently taken with curry and the stem are boiled and fried for preparing vegetables under dietetics including condiments and other food preparation. The young shoots are of the burnt ashes in closed vessels and administered in dyspepsia. The stem is bitter, laxative, aphrodisiac, tonic,

analgesic. It uses to cure pile, chronic ulcer. Plant recommended in Vatavyadhis. Very few classical and traditional formulations are available. Some Classical formulations are discussed below.

1. Asthisrinkhala Vatak.²

It's multi drug preparation of Asthisrinkhala 1 part with black gram flour 1 part.

Indication: The vataka is recommended in treatment of joint disorder.

2. Asthisamharaka Swaras³

Plant stem juice could be used for Nasya (nasal drop purpose) in treatment 2 drops. Indication: Epistaxis, for treating worm infestation add vidanga churna take twice daily.

3. Asthisamharaka lepa³

The leaf crushed and applies on wound to arrest bleeding.

Indication: Fresh wound cuts.

It will arrest bleeding. Especially in wound form due to bone fracture.

4. Asthisamharaka churna³⁶

Asthisrinkhala, arjuna, godhuma, laksha all ingredient taken in equal quantity for in fine powder form mixed with ghrita taken along with milk.

Indication: Asthibhanga chikitsa

5. Asthisamharaka taila²

Oil processed with whole plant for local application.

Indication: It is recommended in treatment of Rheumatoid arthritis and osteoarthritis.

Raw drug standardization (As per API) 1619 of *Cissus quadrangularis* stem^{1, 14, 15.}

Herbal medicines are prepared from materials of herbal origin, which are often obtained from varied geographi-

cal/commercial sources. They may slightly vary in composition and properties due to their minute differences in parameters it directly impacts on quality of final formulation. API has stated the standardized format for each herb specif-

ically so the drug which has been chosen for further processing should have all parameters stated. Analytical value of raw form of *C. quadrangularis L.* like total ash value, extractive value, fixed oil etc., are given in table.

Parameters	Values %
Foreign Matter	< 1% w/w
Total ash	< 5% w/w
Acid insoluble ash	< 1% w/w
Water soluble extractive	> 3% w/w
Fixed oil	> 3% w/w
Sulphated Ash content	< 5% w/w
Arsenic	< 1 ppm
Lead	< 5 ppm
Total bacterial count	< 800 cfu/g
Total fungal count	< 500 cfu/g
Moisture content	< 5% w/w

Phytochemical Constituents

The plant consists various constituents such as flavanoides, triterpenoids, vitamin 'C', stilbene derivatives and many others, e.g. resveratrol, piceatannol, pallidol perthenocissin and phytosterols. Ascorbic acid triterpene, β - sitosterol, ketosteroid two asymmetrical tetracyclic triterpenoids and calcium were identified as major constituents of the plant.^{4, 5, 6.}

The *C. quadrangularis L.* contains high amount of carotene-A, anabolic steroidal substance, mucopolysacchrides and calcium. The plant contains ascorbic acid, 479 mg and carotene 267 mg per 100 gm freshly prepared paste in addition to calcium oxalate. It also contains two steroidal principles

1. C₂₇H₄₅ O, melting points 249-252 °C
2. C₂₃H₄₁ O, melting points 136-138 °C

The stem of the plant contain two asymmetric tetra cyclic triterpenoids.

1. Onocer – 7 ene 3 α , 21 β diol (C₃₀H₅₂ O₂, m.p. 200-202 °C)

1. Onocer – 7 ene 3 β , 21 α diol (C₃₀H₅₂ O₂, m.p. 233-234 °C)

The aerial part contain new asymmetric tetracyclic triterpenoid 7-oxo-O nocer – 8-ene- 3 β 21 α diol (C₃₀H₅₀ O₃, m. p. 235-237 °C).^{7, 8, 9}

The root powder also contain a 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%.^{10, 11, 12, 13, 14.}

Pharmacological activity

Anti inflammatory activity¹⁵-

Flavanoids are inhibiting the inflammatory process. They are inhibitor of lipooxygenase especially luteolin, which

is compound of *C. quadrangularis L.* is known to be inhibitor. The anti-inflammatory activity of β - sit sterol was demonstrated to have an inhibitory effect on edema induced by both carrageens and arachidonic acid. It is suggested that *C. quadrangularis L.* is dual inhibitor of arachidonic acid metabolism.

Anti Osteoporotic activity¹⁷ -

C. quadrangularis L. has been reported in Ayurveda for its anti osteoporotic activity. The phytoestrogen rich fraction (IND- HE) from the aerial parts of plant shows its activity. Plant contains phytoestrogen and triterpenoides. The phytoestrogen steroids isolated plant shows influence on early regeneration and quick mineralization of bone. The ethanolic and petroleum ether extract of *C. quadrangularis L.* shows prominent effect. Various study confirms the anti osteoporotic activity and phytoestrogen rich fraction (IND- HE) of *C. quadrangularis L.* 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 antianabolic effect and exerts some beneficial effects on recovery of bone mineral density. The ethanolic extract of *C. quadrangularis L.* shows ethanol extract of the plant had definite antiosteoporotic effect.

Anti haemorrhoidal activity²⁰ -

Phytochemical study of *C. quadrangularis L.* revealed that its major compounds are flavanoides. The bioflavanoides. Particularly diosmin, hesperidine complex have demonstrated potential in the treatment of hemorrhoids. This

bioflavanoides exhibit phebtonic activity venatonic activity, vasculo protective effects and antagonistic effect on biochemical mediator of inflammation. The extract of *C. quadrangularis L.* produce same activity can also be used as anti haemorrhoidal drug. The herb also possesses analgesic effect which is very useful in painful hemorrhoids. The plant also used as an anti-haemorrhoidal drug in their folk medicine.

Gastro protective activity²¹ -

C. quadrangularis L. is rich source of aryteneoids, 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 L.* against the gastric mucosal damages induced by aspirin.

The studies show that administration of aspirin increased lipid peroxidation status, xanthenes oxides, myeloperoxidase etc. in gastric mucosa resulting in mucosal damages at both cellular level and sub cellular level which more reversed by *C. quadrangularis L.* extract. This finding suggests that the gastro protective creativity of *C. quadrangularis L.* extract possibly through its antioxidant and anti apoptotic effect. Triterpenoides and β sit sterol present in *C. quadrangularis L.* possess anti lipid peroxidative effect and have pivotal role in gastro protective effect of *C. quadrangularis L.* Extract.

Antioxidant^{22, 23} -

The stem part of *Cissus quadrangularis Linn* contain vitamin 'C', carotenoid, calcium, steroidal and these are

known to be excellent antioxidants and numerous studies that dietary intake of plant polyphenol antioxidant may have positive effect in oxidative stress related pathogenesis extract of *C. quadrangularis Linn* were tested for Antioxidant activity by β - carotene linoleic acid model. The ethyl acetate fraction of both fresh and dry stem extract at a concentration of 100 ppm showed 64.8% antioxidant activity in carotene linoleic acid model. The ethyl acetate fraction of both fresh and dry stem extract at a concentration of 100 ppm. showed 65.8% antioxidant activity in β - carotene linoleic acid system. Another study was performed to evaluate the effect of the methanolic extract of *C. quadrangularis L.* against free-radical damage. The text extracted exhibited significantly inhibition in DPPH Free medicinal formulation superoxide radical production and lipid peroxide production in erythrocyte.

Bone healing activity²⁴⁻³³ -

The anabolic steroid principle from *Cissus quadrangularis L.* showed marked influenced in the rate of fracture healing by influencing early regeneration of all connective tissue involve in the healing and quicker mineralization of callus. Systemic use of *Cissus quadrangularis Linn* in rats caused complete restoration of normal composition of bone after four weeks of fracture. All events namely fibroblastic phase (1st week), 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 *Cissus quadrangularis Linn*.

The plant contains vitamins and steroids, which are found to have specific effect on bone fracture healing. The anabolic steroid principles from plant showed a mark influence in the rate of fracture healing by influencing early regeneration of all connective tissues involved in the healing and quicker mineralization of callus. Various studies concluded that *C. quadrangularis L.* cause 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 remodeling takes much faster. Plant builds up the chemical composition of fracture 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. So the effect of plant is more systemic which contain mucopolysacchride in it, which utilize for healing process.

Ayurvedic preparation

Flexi-Muv oil (Anti-inflammatory, Anti-arthritic)

Bone forte capsule (Calcium supplement)

Lakshadi Guggul³⁶ (Analgesic, anti-inflammatory.)

CONCLUSION

Herbal medicines are integral part of development of modern civilization. the literature reviews shows that *C. quadrangularis L.* has various element and it contain active constituent like phytoste-

rol, triterpenoides, mucopolysacchrides etc., in stem which is responsible for its therapeutic efficacy and known to possess Anti oxidant, Anti-inflammatory Bone healing activity which are routinely used to accelerate the process of bone fracture healing. The herb offer good bone healing activity. If used in management of fracture hence isolation and characterization of active principle and their further clinical trial can prove beneficial in drug development process. So drug development from this plant through rational approaches has wide scope in future.

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