



A review on medicinal properties and nutraceutical importance of *Cissus quadrangularis*

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ABSTRACT

Herbal medicine is based on the establishment that plants contain natural substances that can promote health and alleviate illness. Nutraceuticals are naturally derived bioactive compounds that are found in foods, dietary supplements and herbal products, and have health promoting, disease preventing and medicinal properties. *Cissus quadrangularis* (L) Wall. Ex. Wight a perennial climber, Adamant creeper in English, *Pirandai* in Tamil. Its pharmacological activities such as analgesic, anti-inflammatory, antimicrobial, anthelmintic, anti-hemorrhoidal, antioxidant, anti-osteoporosis and bone healing activity. Recognized as a rich source of carotenoids, triterpenoids and ascorbic acid and Proved to have potential for medical effects. Traditional remedies have nutraceutical and medicinal properties, as people has come to know about this, they are in the practice of using this. Aim was to explore the medicinal properties and nutraceutical importance of *C. quadrangularis*. Reputed literatures books and journals were said that the *C. quadrangularis* considered as a versatile medicinal plant in traditional medical system for its valuable medicinal uses and nutraceutical properties. It is a very rich source of nutrition and chemical compounds, which are necessary for proper functioning of human body.

Key Words: *Cissus quadrangularis*, Nutraceutical, Carotenoids, anti-osteoporosis

INTRODUCTION

Medicinal plants play an important role in the management of diseases in developing countries where resources are inadequate. Herbal medicine is based on the premise that plants contain natural substances that can promote health and alleviate illness. The most important of these biologically active constituents of plants are alkaloids, flavonoids, tannins and phenolic compounds (Joseph *et al.*, 2013).

Nutraceutical can be defined as a food or part of a food that provides medical or health benefits, including the prevention and or treatment of a disease (Brower, 1998). Nutritional therapy and herbal-medicine have come out as new concepts of health aid in recent years. Strong recommendations for consumption of nutraceuticals from plant origin have become progressively popular to improve health, and to prevent and treat diseases (Pandey-Rai *et al.*, 2011). Medicinal plants giving a product its specific chemical composition, which in turn reflects the product's nutritive and medicinal properties as well as its culinary value (Kaul *et al.*, 2006). However, the concentrations of basic nutrients and mineral elements are equally important as the content of bioactive substances for the quality of herbal material (Dzida *et al.*, 2015). The *Cissus quadrangularis*, a perennial climber widely used in traditional medicinal systems of Tamilnadu. It invites attention of the researchers worldwide for its pharmacological activities such as analgesic, anti-inflammatory, antibacterial, antifungal, anthelmintic, antihemorrhoidal and free radical scavenging activity, anti-osteoporosis and bone healing activity. *Cissus quadrangularis* Linn has been recognized as a rich source of carotenoids, triterpenoids and ascorbic acid and is proved to have potential for medical effects (Joseph *et al.*, 2013), (Mishra, 2010). Many traditional home remedies are using as a nutraceutical and therapeutic purposes, by knowing which foods can provide specific health benefits. From ancient period people curing illnesses by having the home remedies. Siddha system has preventive and curative methods. Although the nutritional properties of herbs were not revealed 5000 years ago by the ancient *Siddhars*. Recent researches have enlightened that a deeper exploration in the areas of herbs can fetch us to a break-through in combating various diseases and promote healthy living. The *C. quadrangularis* considered as a versatile medicinal plant in traditional medical system for its valuable medicinal uses and nutraceutical properties. It is a very rich source of nutrition and chemical compounds, which are necessary for proper functioning of human body. The objective of the study was to explore the medicinal application and nutraceutical importance of *C. quadrangularis*.

The reputed *Siddha* literatures were collected and data obtained from thesis, research articles and the journals were referred through globally accepted website.

Description of the plant:



Fig. 1: *Cissus quadrangularis* (L) Wall.

Cissus quadrangularis (L) Wall. Ex. Wight, Adamant creeper in English, *Pirandai* in Tamil and *Heerassa* in Sinhala. It is a perennial vine, wide spread in dry areas seashores, coastal regions and scrub jungles, fences of agricultural fields and uninhabited areas. They grow up-to 5m. It is fleshy much rambling shrub climbing over bushes, thorny trees and fences. The mature stem is dark green in colour. New leaves and branches appear in rainy seasons. During summer, the plant is mostly devoid of leaves. The stem is easily broken at the nodal regions. Stem is glabrous, much contracted at nodes and with a waxy coating. It also attains pink colour in some parts of the plant. The mature and older stems have a layer of ash brown colored bark and losing their quadrangular shape to more or less round. The fleshy inner region of the plant produces irritant over the skin and tongue. The internodal region is also observed. It is opposite to tendril, uniform in thickness (2-2.5 mm) and white to pink and blurry brown to black in colour. Petiole is 0.7-4.0cm in length, glabrous, blade, usually broader than length, attains 3.0-6.0 x 4.5-7.2 cm in size. Cordate to rounded, base truncate or cuneate, tip acute to acuminate and margin toothed. Sometimes the leaves are 3-5 lobed. More number of lobed leaves occurs in plant grown in dried areas. Lateral nerves are 3-6 paired. It requires warm tropical climate and propagated by stem cuttings in months of June and July (Mishra *et al.*, 2010)

Traditional aspect of *Cissus quadrangularis* (L) Wall. Ex. Wight

Synonyms:

Tel-Nalleru
Mal-Peranda
Kannada- Vajraballee
Hindi-Harshangar
Sans-Asthisamhari

Parts used: Stem, Root

Properties:

Taste	→	Pungent taste
Potency	→	Hot
Distribution	→	Pungent taste

Actions:

Alterative
Emmenagogue
Stomachic

Medicinal uses:

Relieving from itching of anus (*Eruvai thinavu*), bleeding piles (*Kuruthi moolam*), Indigestion (*Maantham*), Gastritis (*Kunmam*), Diarrhoeas (*Vali kalichchal* and *kuruthi kalichchal*), Oozing piles (*Iya perukku mulai moolam*), Malaise in lower limb (*Kaal oichchal*) and Poor appetite (*Pasi inmai*). (Murukesa, 1988).

Its traditional usages are mostly catered around treating feminine disorders (menopause, loss of libido, and menstrual disorders), antiulcer properties, anti-hemorrhoidal properties, and pain relieving properties (Patel, 2018). The roots and stems are most useful for healing of fracture of the bones. The stem is bitter. It is given internally and applied topically in broken bones. It is also used in complaints of the back and spine. A paste of stem is useful for muscular pains (Malathi, 2014). The plant has been documented in Ayurveda for the treatment of osteoarthritis, rheumatoid

arthritis and osteoporosis. The stem juice of plant is used to treat scurvy, menstrual disorders, otorrhoea and epistaxis. Decoction of shoots with dry ginger and black pepper is given for body pain the infusion of plant is anthelmintic (Joseph *et al.*, 2013).

Chemical compounds:

The result obtained by the preliminary phytochemical analysis and chemical analysis.

Therapeutic action related to its chemical compounds

Presence of 3-ketosteroids, which were anabolic and impart anti-glucocorticoid properties to tissue. These constituents were able to help heal and protect muscles, tendons, and bone through their interaction with cortisol and other hormones and substances found in the body. These substances found in the body. These substances contribute to tissue breakdown by acting as 'cleaners' in times of physical trauma or weakness, allowing dead proteins and other waste to exit the area and help restore tissues their healthy state. Containing water-soluble glycoside, which produces a fall in blood pressure in anaesthetized cats. Calcium oxalate, 3,1- methyl tritriacontanoic acid along with taraxerylacetate, taraxerol and isopentacosanoic acid of fresh stem juice produces irritation on the skin (Kavitha *et al.*, 2015).

Table-1. Preliminary quantitative phytochemical analysis of *Cissus quadrangularis* L.

Compound Test & Reagents		Sample -A	Sample -B
Colour and Physical nature		Dark green oily semi-solid	Dark brown Semi-solid
Carbohydrate	Felhing's	+	+
	Molish's	+	+
	Benedict's	+	+
Alkaloids	Mayer's	-	-
	Wagner's	-	-
	Hanger's	+	+
	Drangondroff's	+	+
Tannins and Phenol	FeCl ₃ Test	+	+
	Lead Acetate	+	+
	Gelatin	+	+
Fixed oil&Fats	Spot test	+	+
Gum & Mucilage	Alcohol precipitation	+	+
Saponin	Foam test	+	+
Phytosterol	L.B. Test	+	+
Flavonoides	Shinoda's	+	+
Extract value			

(+)= Present (-) = Absent

(Sathis Kumar *et al.*, 2012)

Table 2: Chemical constituents of aqueous alcoholic extract of *Cissus quadrangularis* L.

Compound Number	Name of the chemical compounds % Peak Area of Samples	Molecular Formula	Molecular Weight	% Peak Area of Samples	
				A	B
1	n - Hexadecanoic acid	C ₁₆ H ₃₂ O ₂	256	11.65	14.02
2	Ethan -1,1- diethoxy	C ₆ H ₁₄ O ₂	118	11.62	14.15
3	9, 12, 15 - Octadecatrienoic acid methyl ester (Z, Z, Z)	C ₁₉ H ₃₂ O ₂	292	9.48	7.18
4	Tetradecanoic acid, ethyl ester	C ₁₆ H ₃₂ O ₂	256	7.77	-
5	9, 12, Octadecadienoic acid, methyl ester (E, E)	C ₁₉ H ₃₄ O ₂	294	7.12	-
6	Butanedioic acid - 2, 3 - bis (acetyloxy), (R, R*, R*)	C ₈ H ₁₀ O ₈	234	4.43	1.79
7	Ethyl a - d - glycopyranoside	C ₈ H ₁₆ O ₆	208	4.01	5.88
8	13 - Tetradecene - 11 - yn - 1 - ol	C ₁₄ H ₂₄ O	208	3.51	-
9	Glycerin	C ₃ H ₈ O ₃	92	3.47	1.20
10	Tetradecanoic acid	C ₁₄ H ₂₈ O ₂	228	3.43	2.12
11	Benzene - 1, 2, 4 - trimethyl	C ₉ H ₁₂	120	3.36	3.33
12	2- Formylhistamine	C ₆ H ₉ N ₃ O	139	3.33	4.93
13	Phytol	C ₂₀ H ₄₀ O	296	3.06	-
14	Glycerin	C ₃ H ₈ O ₃	92	3.01	4.23
15	2 - Cyclopenten - 1 - one, 2 - hydroxyl	C ₅ H ₆ O ₂	98	2.98	Trace
16	Undecanoic acid	C ₁₁ H ₂₂ O ₂	186	2.63	2.38
17	Octadecanoic acid, ethyl ester	C ₂₀ H ₄₀ O ₂	312	2.23	3.03
18	DL - 3, 4 - Dimethyl - 3, 4 - hexane diol	C ₈ H ₁₈ O ₂	146	2.02	Trace
19	Hexanedioic acid, mono 2- ethylhexyl) ester	C ₁₄ H ₂₆ O ₄	258	1.90	2.19
20	4H-Pyran-4-one, 2, 3 - dihydro- 3, 5 - dihydroxy - 6 - methyl146	C ₆ H ₈ O ₄	144	1.58	1.07
21	DL - 3, 4 - Dime248thyl - 3, 4 - hexane diol120	C ₈ H ₁₈ O ₂	146	1.30	0.65
22	1, E - 11, Z - 12613 - Octadecatriene172	C ₁₈ H ₃₂	248	1.19	2.00
23	Benzene - 1 - ethyl208yl - 3 - methyl134	C ₉ H ₁₂	120	1.02	1.03
24	2- Furancarboxaldehyde, 5 - hydroxyl methyl)	C ₆ H ₆ O ₃	126	0.89	Trace
25	n - Decanoic acid	C ₁₀ H ₂₀ O ₂	172	0.79	-
26	Asarone	C ₁₂ H ₁₆ O ₃	208	0.76	Trace
27	1, 3, 8 - P - Menthatrien	C ₁₀ H ₁₄	134	0.62	Trace
28	Phenol- 4 - (3- hydroxyl-1-Propenyl) - 2 - methoxy	C ₁₀ H ₁₂ O ₃	180	Trace	0.95
29	Nonanoic acid, 5 - methyl, ethyl ester	C ₁₂ H ₂₄ O ₂	200	Trace	-
30	1, 2, 3 - Propanetriol, monoaceta	C ₅ H ₁₀ O ₄	134	0.82	0.40
31	Benzene - 1 - ethyl 2,4 - dimethyl	C ₁₀ H ₁₄	134	-	Trace
32	Nonanol	C ₉ H ₁₈ O	142	-	0.42
33	Benzene - 1 - methlethyl	C ₉ H ₁₂	120	-	Trace
34	D -Glycero - d - tallo - heptose	C ₇ H ₁₄ O ₇	210	-	0.45
35	Dacanoic acid, octyl ester	C ₁₈ H ₃₆ O ₂	248	-	Trace
36	Hexadecanoic acid, ethyl ester	C ₁₈ H ₃₄ O ₂	282	-	8.30
37	Oleic acid	C ₁₈ H ₃₄ O ₂	282	-	9.19
38	Linoleic acid ethyl ester	C ₂₀ H ₂₆ O ₂	308	-	5.97

(Sathis kumar T *et al.*, 2012)

Pharmacological Activities

Studies on fracture healing suggest that this unidentified anabolic steroid may act on estrogenic receptors of the bone. Efficacy of *C. quadrangularis* on early ossification and remodeling of bones have been reported and it has been observed that *C. quadrangularis* acts by stimulation of metabolism and increased uptake of the minerals calcium, sulphur and strontium by the osteoblasts in fracture healing (Prasad *et al.*, 1972), (Udupa *et al.*, 1965). The analgesic effect of this plant when used in bone fractures may be of great value in relief of pain which is a constant feature in these cases. As it compared well with acetyl salicylic acid in its analgesic response the nature of its chemically active constituents needs to be explored (Jainu *et al.*, 2005). *C. quadrangularis* significantly inhibits anti-anabolic effects and exerts some beneficial effects on recovery of bone mineral density in postmenopausal osteoporosis (Mishra *et al.*, 2010). The present investigation suggests that *C. quadrangularis* not only strengthens mucosal resistance against ulcerogens but also promotes healing by inducing cellular proliferation. Thus *C. quadrangularis* has potential usefulness for treatment of peptic ulcer disease. The stem part of *C. quadrangularis* contains vitamin C, carotenoids, calcium, steroidal and these are known to be excellent antioxidants and numerous studies suggest that dietary intake of plant polyphenol antioxidants may have positive effects in oxidative stress related pathologies. These anti-oxidative constituents present in *C. quadrangularis* might be responsible for the free radical scavenging activity, anti-lipid peroxidative and anti-superoxide formation (Mishra *et al.*, 2010). As the combination of flavonoids (90% diosmin and 10% hesperidin) used clinically for the treatment of hemorrhoid 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 hemorrhoids and varicose veins (Lyseng-Williamson *et al.*, 2003). A number of studies have analysed and revealed the effect against gastric toxicity and the gastro protective effect of *C. quadrangularis* extract (CQE) along with its mechanism underlying the therapeutic action against

the gastric mucosal damage induced by aspirin (Szabo *et al.*, 1985), (Jainu *et al.*, 2003).

Side effects

Improper intake can cause dry mouth, feeling of increased heat, burning sensation, sleeplessness, headache, restlessness, vertigo, excessive sweating and diarrhea. Most of the side effects occurs when used in unnatural form in a dosage of more than 1200mg, as a juice more than 40 ml and dried powder more than 6 grams per day. The dosage can vary individually and should take it under supervision of the physician.

Medicinal preparations

1. Pirandai uppu- 1200 mg per day promote muscle tone, and has been relived gastritis, stomatitis, halitosis
2. Ingi pirandai lekiyum - Punai kaai size has been relived gastritis
3. Sarvasangaara uppu-130 mg with thirikaduku powder and honey, two times per day relived Cough and dyspnea
4. Pirandai vadakam with honey or butter milk has been relived Abdominal pain, Gastritis and Indigestion.
5. 1300mg- 1950 mg (10-15 kunri edai) of dried root powder intake in twice per day will be cured the bone fracture.
6. Sundai kaai size of equal part of *C. quadrangularis* stem and pepper paste take in twice per day relived dyspnea.
7. Paste of plant stem, salt, tamarind and chilly will cure or dried powder made with buttermilk will cure indigestion, abdominal distension, diarrhea.

Nutraceutical preparations.

Nutraceutical food for health are an important part of an overall healthful lifestyle that includes a balanced diet and physical activity. People should strive to consume a wide variety of *C. quadrangularis* preparations including the examples listed here.

Pirandai thuvaiyal

Choose the tender stem for cooking as the thick matured ones will cause itching in the throat string the stem and scrap or peel the sharp angular edge of all side and discard the nodes and leaves. It is advisable to grease hands with sesame seed oil before handling the plant to prevent itching. Wash and cut it into small pieces and set aside. Heat a table spoon of oil in pan,



Figure 2 : Peel fiber of *C. quadrangularis*

add urad dal, red chillies, tamarind, Surry leaves and ginger. Saute until dal turns golden brown. Remove from pan and keep it aside. In the same pan, add another tablespoon of oil and saute the *C. quadrangularis* on medium heat until it turns pale green. Sauteing the *C. quadrangularis* well in oil is very important otherwise you will have itching in the throat after eating or even while eating. Once the *C. quadrangularis* is sautéed well, add grated coconut and saute for another 2-3 seconds. Add salt needed and switch off the heat. Leave it to cool. Grind the *C. quadrangularis* with the dal to a slightly coarse paste (Shanthini, 2015)

Pirandai Thosai

Soak the gram and rice for three hours and grind to make the batter. When half ground adds the *C. quadrangularis* pieces and salt and allow the batter to ferment for eight to ten hours. Pour the dosai as usual (Diviya, 2013)

Pirandai kulambu

Peel fiber of *C. quadrangularis* and cut into small pieces. Peel onion and garlic and chop finely. Chop tomato. Heat gingelly oil in a frying pan and add mustard, cumin, fenugreek and urad dal. When it splutters add onion, curry leave and garlic. Saute till transparent. Add *C. quadrangularis* and saute 10-15 minutes. Then add tomato. Add sambar powder, turmeric powder and salt. Soak tamarind in little water. Add tamarind water and allow it to boil till oil separates boil it in the low flame.

Pirandai pappadam

Soak urud dal for 1 hour and grind it in to a fine thick paste. Grind the *C. quadrangularis* and salt together. But add pappad soda with *C. quadrangularis* and salt. Mix all together and prepare papaddm.

Pirandai pickle / Pirandai Urugaai.

Dry roast dry red chilli, fenugreek seeds on a medium flame and transfer to a plate. Add ½ teaspoon of gingili oil and *Ferulla asafetida* till it turns in colour. Cool down all three ingredients and grind it to a fine powder. Now pickle spice powder is ready. Pinch tamarind into small piece sand saute for few seconds. Wash the *C. quadrangularis* well and add to the pan. Saute till the *C. quadrangularis* becomes soft and shrinks. Cool down all the ingredients. One cooled, grind sautéed *C. quadrangularis* and tamarind to a paste. Towards the end of the grinding, add salt. Heat oil in the pan. Add ground pickle spice powder, Mix well. Cook till the oil oozes out from the sides of the pan. Transfer the prikle to the clean dry bottle (Uma, 2015).

Pirandai Vadai

Take tender *C. quadrangularis* and cut into small pieces. Cut green chilli, ginger, curry leaves into small pieces. Mix finger millet (*kaezhvaragu*) flour with salt, green chilli, ginger and curry leaves. Heat ghee in a frying pan. Add *C. quadrangularis*, fry and add to the finger millet flour. Add water and knead to a dough. Set the dough aside for an hour. Make balls of the dough, flatten and cut into desired shapes. Heat oil in a frying pan. Add the shapes and fry till golden brown.

Pirandai Chutney

Peel the skins of *C. quadrangularis* pieces and fry them in oil and keep it aside. Heat oil in a frying pan. Add mustard, red chili, asafetida, black gram dal and fry. Add tamarind and sauté. Grind all the items along with salt in a mixer.

Pirandai Thokku

Wash the *C. quadrangularis* well and break it into bits at each node. Wash the coriander, the mints leave, curry leaves and ajwain leaves well, and remove the

thick stalks while keeping the tender ones intact. Roast the fenugreek seeds and red chilies in 1 teaspoon of oil till they are browned. Let this cool. Then grind with asafetida and salt in your dry grinder to a coarse consistency. Heat one tablespoon of oil and add the *C. quadrangularis*, coriander, mint and ajwain along with the tamarind. Roast till the leaves wilt. Cool this. Add this mixture to the coarsely ground paste along with the ginger and grind in the blender. It should not be too finely ground. Now heat the remaining oil, add mustard seeds, allow them to pop and then add the ground paste to it. Sauté it for 5-6 minutes on a dry flame and allow it turn a dark green. This can be preserved in a bottle in a refrigerator for quite long. You can even keep some amount for immediate use in the refrigerator and store the rest in the freezer section till required. This can then be thawed and used later (Sridhar, 2012).

CONCLUSION

Traditional recipes for treatment of physical and mental ailments exist in all major ancient civilizations of the world. Nutraceuticals are naturally derived bioactive compounds that are found in foods, dietary supplements and herbal products, and have health promoting, disease preventing and medicinal properties. *C. quadrangularis* received considerable attention because of its presumed safety and potential nutritional and therapeutic effects. Home remedies of *C. quadrangularis* are routinely used to accelerate the process of health benefits. *C. quadrangularis* is a very rich source of nutrition and chemical compounds, which are necessary for proper functioning of human body.

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