



**INVESTIGATION ON SECONDARY METABOLITES IN
CISSUS QUADRANGULARIS LINN.**

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ABSTRACT

Cissus quadrangularis L., of family Vitaceae, commonly known as 'Hadjod' is having a lot of medicinal importance. The active compounds isolated from this plant are considered to be very effective in various treatments such as osteoporosis, asthma, cough, hemorrhoids and gonorrhoea. This paper represents the phytochemical analysis of *Cissus quadrangularis* L. The results obtained showed that the secondary metabolites were present in all the plant parts. Petroleum ether proved better for extraction. Saponins are high in petroleum ether extract of root, stem and leaf. The quantitative estimation of alkaloids is higher in stem and leaves i.e. 103.99 and 78.72 mg/100 gm respectively and phenols is higher in stem (0.322mg/100gm) and lower in roots (0.016mg/100gm).

KEYWORDS: alkaloids, *Cissus quadrangularis*, petroleum ether, vitaceae

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INTRODUCTION

The investigation of plants for bioactive secondary metabolites is an area which most plant scientists have recently focused with an aim of discovering new clinically useful and commercially important plant products¹. The medicinal value of these secondary metabolites is due to the presence of chemical substances that produce a definite physiological action on the human body. The most important of these include alkaloids, glucosides, glycosides, steroids, flavanoids, fatty oils, phenols and resins. *Cissus quadrangularis* is the most common species, belonging to the family Vitaceae, commonly known as "Hadjod." The leaves are simple or lobed, cordate, broadly ovate or reniform, serrate, dentate, sometimes 3-foliolate and glabrous. Flowers are small, greenish white, bisexual, tetramerous, opposite to the leaves. Fruit is globose or obovoid fleshy berries. The stem and leaf of *C. quadrangularis* is used for the treatment of hemorrhoid, menstrual disorder, scurvy, antioxidant, anti-flatulence, antibacterial and antifungal. Pharmacological studies showed the bone fracture healing property² and antiosteoporotic³ effect of this plant. Two capsules of 500 mg dry powder of *C. quadrangularis* taken twice a day were very effective in the treatment of hemorrhoidal pain and inflammation as well as reducing the size of hemorrhoids⁴. 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 and is used in complaints of the back and spine⁵. A paste of stem is useful for muscular pains⁶. The plant has been documented in Ayurveda for the treatment of osteoarthritis, rheumatoid arthritis and osteoporosis^{7,8}. The stem juice of plant is used to treat scurvy, menstrual disorders, otorrhoea and epistaxis⁹. The use of sap with tamarind has been reported in East Africa for the treatment of gonorrhoea¹⁰. The herb is fed to cattle to induce flow of milk. The ash of plant is useful as a substitute for baking powder¹¹. A paste of stem is given in asthma, burns and wounds, bites of poisonous insects and for saddle sores of horses and camels^{12,13}. The

extract of the plant exhibit cardiogenic and androgenic property¹⁴. Hence, due to the high medicinal property of this plant it has been intended to undertake qualitative and quantitative analysis of secondary metabolite from different plant parts (root, stem and leaves) of *Cissus quadrangularis* Linn. by using various extraction solvents.

MATERIALS AND METHODS

(i) Collection of plant material

The experimental plant material i.e. roots, stem and leaves of *Cissus quadrangularis* L. were collected from Departmental Garden, Sant Gadge Baba Amravati University, Amravati in the month of August 2011. The plant herbarium was prepared, deposited in the Departmental Museum.

(ii) Sample Preparation

The plant material were thoroughly washed with water to remove contamination. The roots, stem and leaves of *Cissus quadrangularis* were subjected to shade drying and further crushed to powder, then the powder was passed through the sieve and stored in air tight container for further use.

(iii) Phytochemical screening

Both qualitative (Detection of alkaloids, saponins, tannins flavonoids: amino acids, anthraquinones, glycosides and steroids) and quantitative (Detection of phenols and alkaloids) were conducted using different standard methods as described by Harborne¹⁵ and Raman¹⁶. Extraction was carried in different organic solvents such as petroleum ether, chloroform, and distilled water by Soxhlet's Apparatus for 6-8 hrs. The powder (1 gm each) of the *Cissus quadrangularis* L. was passed through successive extraction solvents. The extract obtained was further concentrated through evaporation and then used for quantitative analysis.

RESULTS AND DISCUSSION

The successive extract of root, stem and leaves in various solvents like petroleum ether, chloroform and aqueous distilled water have revealed the presence of secondary metabolites. The results obtained showed that the secondary metabolites are present in all the plant parts (Table 1). *Cissus quadrangularis* have numerous bioactive compounds such as alkaloids, resveratrol, piceatannol, pallidol, parthenocissin, quadrangularins, ascorbic acid, carotene, phytosterol substances, calcium, flavinoids, vitamins, enzymes, nicotinic acid, tyrosine and triterpenoids, *Cissus quadrangularis* contains a variety of terpenoid components, such as the balsam ketone, amyirin¹⁷. Wagner's test for the presence of alkaloids was performed. It was observed that alkaloids are present in all the extracts but absent in root extract of chloroform and distilled water. Mayer's test for the presence of alkaloids proved positive in leaf extract of petroleum ether, leaf extract of chloroform and in stem and leaf extract of distilled water. The ferric chloride test for the presence of tannins proved negative in root and stem extract of petroleum

ether and in root and leaf extract of chloroform. Acid alkaline test for flavonoids proved positive for stem extract of petroleum ether and for all the plant parts in distilled water extract. Saponins are present in petroleum ether extract of root, stem and leaf and negative for remaining two solvent extracts. Phenols are absent in root extract of chloroform and stem and leaf extract of distilled water and absent in other plant parts. Amino acids are present in petroleum ether extract of leaf, stem extract of chloroform and in leaf extract of distilled water. Anthocyanin is absent in leaf extract of in petroleum ether and chloroform and positive for rest of the solvent extractions. Glycosides proved positive in stem and leaf extracts of chloroform and negative for rest of the plant parts. Steroids are absent in only root extract of chloroform and present in rest of the solvents. Phytochemical analysis shows the presence of many medicinally important secondary metabolite types of phytoconstituents in *Cissus quadrangularis* like alkaloids, cardiac glycosides, saponins, triterpenes, which indicates that the plant possesses high profile values and can be used to treat various kinds of diseases¹⁸.

Table 1
Comparative analysis of Phytochemical screening of root, stem and leaf of *Cissus quadrangularis* Linn.

Tests	Reagents	Petroleum ether			Chloroform			Distilled water		
		Root	Stem	Leaf	Root	Stem	Leaf	Root	Stem	Leaf
Alkaloids	Wagner's	+	+++	++	---	++	+	--	+++	+++
	Mayer's	--	--	+	---	--	++	--	++	++
Tannins	Ferric chloride test	---	---	+++	---	+++	--	+++	+	+++
Flavonoids	Acid alkaline test	---	+++	---	--	---	---	+	+++	+++
Saponins	Foam test	+++	+++	++	---	--	--	--	-	-
Phenols	Folin-ciocalteu test	+	+	++	-	++	+	++	-	+
Amino acid	Ninhydrin reagent	--	---	++	--	+	++	-	++	---
Anthocyanin	Ammonia	+	+++	-	++	+	-	+++	++	++
Glycosides	Sodium nitropro side solution	-	++	++	-	-	--	-	--	--
Steroids	Chloroform	--	+++	++	+	+	+++	++	+	++

Each value is the mean of three replicates.

The quantitative estimation of alkaloids (Figure 1) is in the range of 11.14 to 103.99 mg/100gm, which is higher in stem and leaves i.e. 103.99 and 78.72 mg/100gm respectively and lowers in roots i.e.

11.144. Phenols vary from 0.016 to 0.322 mg/100 gm (Figure 2), phenols are higher in stem i.e. 0.322 mg/100 gm and lower in roots and leaves i.e. 0.061 and 0.016 mg/100 gm respectively.

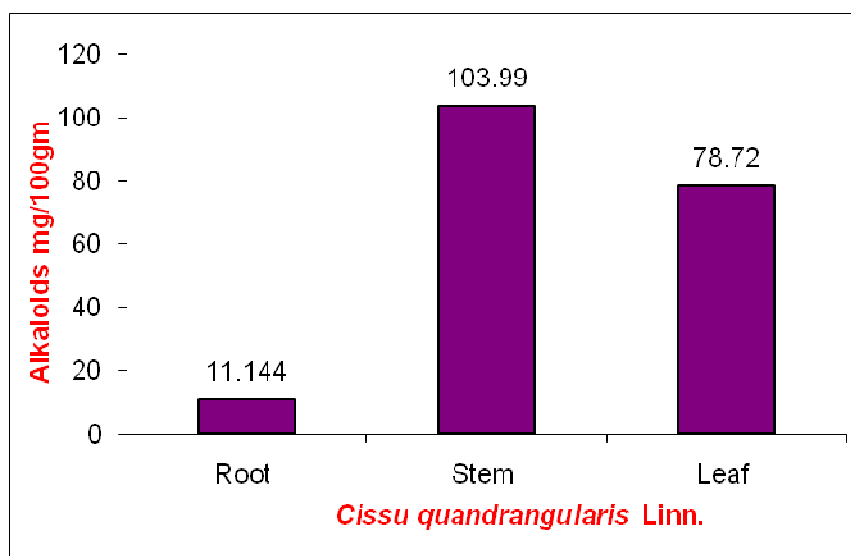


Figure 1
Concentration of Alkaloids present in root, stem and leaf of *Cissus quadrangularis Linn*

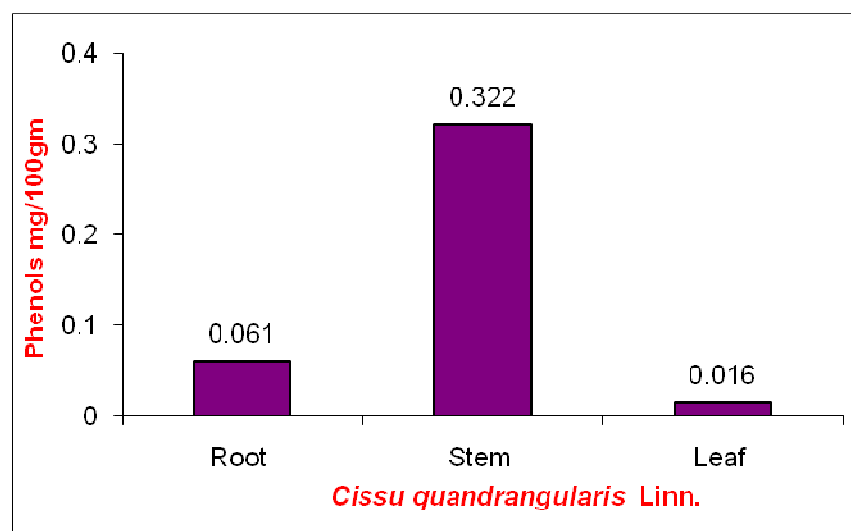


Figure 2
Concentration of Phenols present in root, stem and leaf in *Cissus quadrangularis Linn*

CONCLUSION

Petroleum ether proved best extraction solvent as compared to other solvents such as chloroform and distilled water. The presence of various secondary metabolites like alkaloids,

phenols, saponins and flavonoids in *Cissus quadrangularis* makes very much important in herbal medicine. The high content of phenols can be used in drug formulations to treat various kinds of diseases.

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