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Comparative quantification of flavonoid content and antioxidant potential of indigenous medicinal plants

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Abstract

Medicinal plants are considered as rich sources of ingredients which can be used in drug development either pharmacopeial, non-pharmacopeial, or synthetic drugs. Some plants are considered as important sources and as result of that they are recommended for their therapeutic values. The present investigation describes the phytochemical analysis, flavonoid contents, *in vitro* antioxidant activity of *Cissus quadrangularis* and *Muntingia calabura* plant extracts. The flavonoid content was estimated by spectrophotometric method & antioxidant property of aqueous & alcoholic extracts of these plants estimated by % Hydrogen Peroxide (H₂O₂) scavenging activity. Ethanolic extract of *Muntingia calabura* leaves revealed the presence of high flavonoid content. All extracts showed significant antioxidant activity in correlation to phytoconstituents of the extracts. Results showed that the ethanolic and aqueous extract of *Cissus quadrangularis* exhibited a higher antioxidant activity as compared to alcoholic & aqueous extract of *Muntingia calabura*.

Keywords: *Cissus quadrangularis*, *Muntingia calabura*, phytoconstituents, flavonoid content, antioxidant activity

Introduction

Nature has provided a complete storehouse of remedies to cure all ailments of mankind, this is where, nature provides various drugs in the form of herbs, plants and algae's to cure the incurable diseases without any toxic effects. Our own Ayurvedic system has given solution to all kind of disease which was considered even impossible for other field of medical science [1]. Oxidation is essential for productions of energy in biological system. Free radicals, radical derivatives are useful during oxidation but hazards to living organism at high concentration and may cause to cellular constituents. In several countries a medicinal property of plants are investigated to identifying phytochemicals with potential therapeutic effects [2]. *Cissus quadrangularis* L., belongs to Vitaceae family, is an indigenous medicinal plant of India. The stem of *Cissus quadrangularis* is also reputed In Ayurveda as alterative, anthelmintic, dyspeptic, digestive, tonic, analgesic in eye and ear diseases, asthma, and in complaints of the back and spine [3]. *Muntingia calabura* L., belongs to Muntingiaceae family, is a fast-growing plant all over India. The leaves are rich in flavanoidal compounds like flavones, flavanones, flavans and biflavans as the major constituents, possessing antidiabetic and cytotoxic activities. It has found to contain alkaloids, proteins, flavonoids, anthraquinone glycosides. Other parts like roots, flowers used as antidyspeptic, antispasmodic, diaphoretic to treat headaches, dyspepsia and spasm [4]. In view of above facts, in present investigation, we have carried out the phytochemical analysis, flavonoid content and antioxidant activity of aqueous and ethanolic extracts of *Cissus quadrangularis* and *Muntingia calabura* plants. And comparative studies of phytochemical analysis, flavonoid content and antioxidant activity of aqueous and ethanolic extracts of *Cissus quadrangularis* and *Muntingia calabura* plants.

Materials and Methods

Collection and drying of plants

The stem powder of *Cissus quadrangularis* plant was purchased from Manakarnika Aushadhalaya (CA-1549) Chinchwad. After authentication from Botanical survey of India, *Muntingia calabura* leaves were collected from local areas in Moshi. Further these plant materials were subjected to drying in shed. The dried leaves of *Muntingia calabura* were powdered by pulverization and were stored in air tight container.

Extraction

Aqueous extract of both plants was obtained by maceration technique where as ethanolic extract of both plants was obtained by using soxhlet extraction [5].

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The extracts were referred as *Cissus quadrangularis* aqueous extract (CQAE), *Cissus quadrangularis* ethanolic extract (CQEE), *Muntingia calabura* aqueous extract (MCAE), *Muntingia calabura* ethanolic extract (MCEE) respectively. The extracts were filtered and concentrated using rotary flash evaporator. The yield and physical appearance of extracts are indicated in table 1.

Qualitative phytochemical screening

All extract were qualitatively tested for the presence of chemical constituents by performing various tests like Wagner test for alkaloids, Shinoda test for flavonoid, Salkowask test for steroid, Borntrager test for anthraquinone glycoside, & foam test for saponin [6]. Results of Phytochemical analysis of all extracts are mentioned in table 2.

Quantitative analysis of extracts

Determination of total flavonoid content

Total flavonoid contents in extract were determined by using UV spectrophotometer referring quercetin as standard. 1 ml plant extract (1mg/ml) and 2ml water was added in 10 ml volumetric flask. After 5 min addition, 3ml 5 % sodium nitrate and 0.3 ml 10 % aluminium chloride were added. Then

after 6 mins 2 ml (1M) of sodium hydroxide was added in same volumetric flask. Volume was adjusted up to 10 ml with water and absorbance was measured at 510 nm using UV spectrophotometer. % of total flavonoid content was calculated from calibration curve of quercetin (5-50µg) by plotting graph absorbance vs concentration. Total flavonoids were expressed as quercetin equivalents in milligrams per gram sample [7]. Table 3 shows the total flavonoid contents in extracts.

Evaluation of antioxidant activity of plant extracts

A solution of H₂O₂ (40mM) was prepared in phosphate buffer (PH 7.4). Extracts of both plants (20, 40, 60,80,100 µg/ml) in distilled water were added to H₂O₂ solution (0.6ml,40mM).After 10 min, absorbance of H₂O₂ at 230 nm was determined against blank solution containing phosphate buffer without H₂O₂. The % of H₂O₂ scavenging of both plant extract and standard compound (Ascorbic Acid) was calculated, H₂O₂ scavenging activity (%) = (A₀-A₁/ A₀) x 100 Where, A₀ is the absorbance of control & A₁ is the absorbance of sample [8]. % inhibition of antioxidant activity of both plants extracts are mentioned in table 4.

Results

Table 1: Yield and Physical appearance of extracts of *Cissus quadrangularis* and *Muntingia calabura*.

Sr. No.	Parameters	CQAE	CQEE	MCAE	MCEE
1.	Colour	Yellowish Brown	Dark Brown	Greenish Brown	Brown
2.	Consistency	Sticky and Semisolid	Sticky and Semisolid	Sticky and Semisolid	Semisolid
3.	% Yield	11.6 %	7.7 %	10.2%	8.6%

Table 2: Preliminary phytochemical screening of extracts of *Cissus quadrangularis* and *Muntingia calabura*.

Sr. No.	Tests	CQAE	CQEE	MCAE	MCEE
1.	Alkaloids (Wagner test)	-	+	-	+
2.	Flavonoids (Shinoda test)	+	+	+	+
3.	Steroids (Salkowask test)	-	+	-	-
4.	Saponins (Foam test)	+	-	-	-
5.	Anthraquinone glycoside (Borntrager test)	-	+	-	+

(-) absent, (+) present

Table 3: Total flavonoid contents in extracts of *Cissus quadrangularis* and *Muntingia calabura*.

Sr. No.	Extracts	Total flavonoid content (µg/mg)	Total flavonoid content (%)
1.	CQAE	5.35	35.66
2.	CQEE	25.17	50.34
3.	MCAE	13.03	26.06
4.	MCEE	35.35	70.70

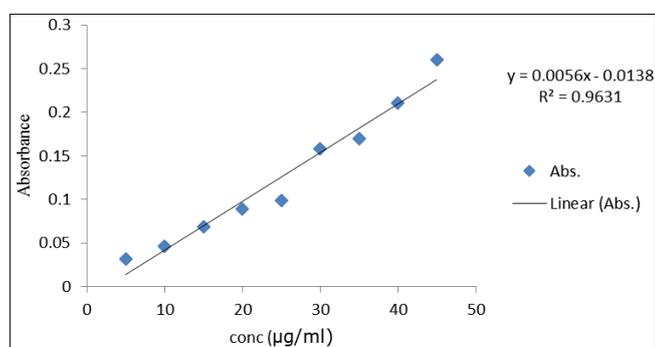


Fig 1: Calibration curve of quercetin

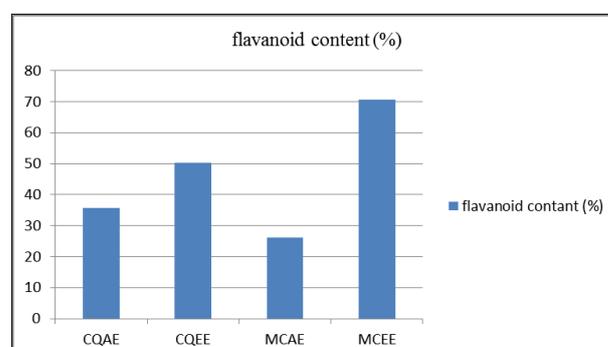
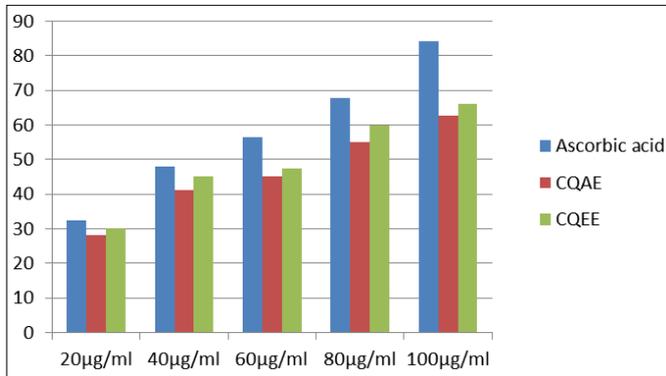
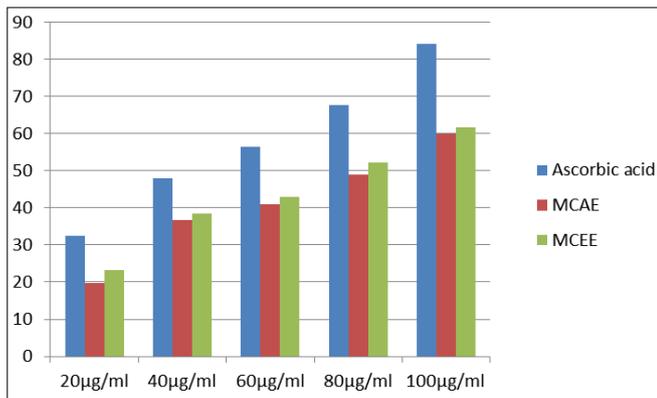


Fig 2: Total flavonoid content of plant extracts

Table 4: Antioxidant activity of *Cissus quadrangularis* and *Muntingia calabura* extracts.

Sr. No.	Conc (µg/ml)	CQAE (%)	CQEE (%)	MCAE (%)	MCEE (%)	Ascorbic acid
1.	20	28.16	30.28	19.71	23.23	32.39
2.	40	41.19	45.07	36.61	38.38	47.88
3.	60	45.07	47.53	40.84	42.95	56.33
4.	80	54.92	59.85	48.94	52.11	67.60
5.	100	62.67	66.19	59.85	61.61	84.15

**Fig 3:** Total antioxidant activity of aqueous & alcoholic extract of *Cissus quadrangularis*.**Fig 4:** Total antioxidant activity of aqueous & alcoholic extract of *Muntingia calabura*.

Discussion

The % yield was found to be 11.6%, 7.7%, 10.2% and 8.6% for CQAE, CQEE, MCAE and MCEE respectively. The phytochemical investigation of extracts shows presence of flavonoid, alkaloid, and steroids. The flavonoid content is higher in aqueous extract of *Cissus quadrangularis* & alcoholic extract of *Muntingia calabura*. All extracts showed an increase in antioxidant capacity with increase in concentration. *Cissus quadrangularis* extracts showed higher antioxidant capacity as compared to *Muntingia calabura* extracts.

Conclusion

Based on the above studies it was concluded that both these plants, *Cissus quadrangularis* and *Muntingia calabura* are significant in their properties. *Cissus quadrangularis* and *Muntingia calabura* are natural sources of antioxidant substances in preventing oxidative stress related diseases.

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