

ANALYSIS OF CHEMICAL COMPOSITION OF *CISSUS QUADRANGULARIS* LINN. BY GC-MSR. ESWARAN<sup>1</sup>, A. ANANDAN<sup>1</sup>, A.DOSS<sup>2</sup>, G. SANGEETHA<sup>3</sup> AND S. P. ANAND<sup>2\*</sup><sup>1</sup>Department of Genetics and Plant Breeding, Annamalai University, Annamalai Nagar - 608 002, Tamil Nadu, South India,<sup>2</sup>PG & Research Department of Botany, National College (Autonomous), Tiruchirappalli - 620 001, Tamil Nadu, South India.<sup>3</sup>Department of Plant Pathology, Annamalai University, Annamalai Nagar - 608 002, Tamil Nadu, South India, Email: dranandsp@gmail.com

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## ABSTRACT

Plants are a tremendous source for the discovery of new products of medicinal value for drug development. Today several distinct chemicals derived from plants are important drugs currently used in one or more countries in the world. Many of the drugs sold today are simple synthetic modifications or copies of the naturally obtained substances. In the present study, the bioactive components of *Cissus quadrangularis* Linn. whole plant has been evaluated using Gas Chromatography-Mass Spectrum (GC-MS). Ten compounds in methanolic extract were identified. n-Hexadecanoic acid (25.63%) was the prevailing compound in methanolic extract, which is suggested to be an anticancer compound.

**Keywords:** *Cissus quadrangularis*, Vitaceae, Medicinal plant, GC-MS, Phytol.

## INTRODUCTION

Phytotherapy, the use of plants to medical purposes, is one of the oldest practices in the world. The traditional practice, based on empirical data, is considered as folk medicine and the approach based on scientific studies aims to extract and study active components from plants. A wide range of medicinal plants parts is used to extract as raw drugs and they possess varied medicinal properties. While some of these raw drugs are collected in smaller quantities by the local communities and folk healers for local use, many other raw drugs are collected in larger quantities and traded in the market as the raw materials for many herbal industries (Uniyal *et al.*, 2006). Plants used for traditional medicine contain a wide range of substances that can be used to treat chronic as well as infectious diseases. Clinical microbiologists have great interest in screening of medicinal plants for new therapeutics (Periyasamy *et al.*, 2010). The active principles of many drugs found in plants are secondary metabolites.

*Cissus quadrangularis* Linn. (Family: Vitaceae) is commonly distributed thorough out the hotter parts of India and Sri Lanka (Nadkarni, 1954; Chopra *et al.*, 1986). The stem of *Cissus quadrangularis* is also reputed in Ayurveda as alterative, anthelmintic, dyspeptic, digestive, tonic, analgesic in eye and ear diseases, in the treatment of irregular menstruation and asthma, in complaints of the back and spine. Scientific studies have revealed the *Cissus* extract to possess cardiogenic and androgenic property (Chopra *et al.*, 1986). Hence the present investigation was carried out to determine the possible chemical components from *Cissus quadrangularis* leaves by Gas Chromatography and Mass Spectrum.

## MATERIALS AND METHODS

## Plant material

*Cissus quadrangularis* was collected in Trichy District, Tamilnadu. The botanical identify of the plant was confirmed by Dr. V. Sampath kumar, Scientist C, Botanical Survey of India (Southern Circle), Coimbatore, Tamilnadu.

## Plant sample extraction

50gm powdered plant material was soaked in 200ml of absolute alcohol overnight and then filtered through whatmann filter paper No.41 along with 2gm sodium sulfate to remove the sediments and traces of water in the filtrate. Before filtering, the filter paper along with sodium sulphate is wetted with absolute alcohol. The filtrate is then concentrated by bubbling nitrogen gas into the solution and reduce the volume to 1ml. The extract contains both polar and non-polar phytocomponents.

## GC - MS Analysis

GC-MS analysis was carried out on a GC Clarus 500 Perkin Elmer system comprising a AOC-20i auto sampler and gas chromatograph interfaced to a mass spectrometer (GC-MS) instrument employing the following conditions: Column Elite-1 fused silica capillary column (30mm×0.25mm I.D ×1 μ M df, composed of 100% Dimethyl poly siloxane ), operating in electron impact mode at 70 eV; helium (99.999%) was used as carrier gas at a constant flow of 1ml/min and an injection volume of 0.5 μ l was employed (split ratio of 10:1) injector temperature 250 °C; ion-source temperature 280 °C. The oven temperature was programmed from 110 °C (isothermal for 2 min), with an increase of 10 °C/min, to 200 °C, then 5 °C/min to 280 °C, ending with a 9 min isothermal at 280 °C. Mass spectra were taken at 70 eV; a scan interval of 0.5 seconds and fragments from 45 to 450 Da. Total GC running time is 46min.

## RESULTS AND DISCUSSION

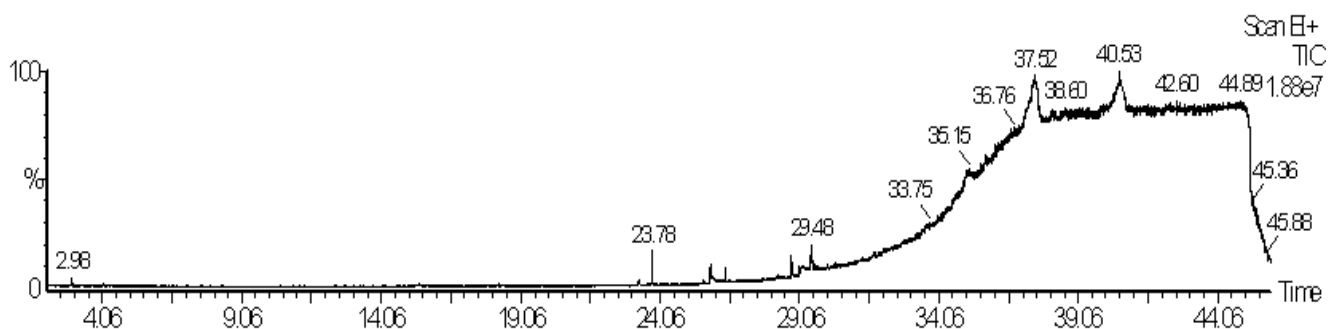
The composition and identification of the main components present in the *Cissus quadrangularis* are shown in (Table 1). Nine compounds were identified in *C. quadrangularis* by GC-MS analysis. The active principles with their retention time (RT), molecular formula, molecular weight (MW) and concentration (%) are presented in (Table 1 and Fig 1). It was found that the main constituents of leaves n-Hexadecanoic acid (25.63%), 1, 2-Benzenedicarboxylic acid, bis (2-methylpropyl) ester (23.17%), Hexadecanoic acid, ethyl ester (15.98), Phytol (14.35%), Hexadecanoic acid, ethyl ester (7.57), Caffeine (3.20%) and Dibutyl phthalate (2.00%).

The n-Hexadecanoic acid-, methyl/ethyl ester of hexadecanoic acids are considered as fatty acids and these play important role in biological process. (Aleryani *et al.*, 2005; Bao *et al.*, 2002). Like other plants, *Litsea glutinosa* (Chowdhury *et al.*, 2008), *Suaeda maritima* (Leach *et al.*, 1990), *Alpinia hainanensis* and *Alpinia katsumadai* (Nan *et al.*, 2004). Hexadecanoic acid methyl ester, also known as Methyl palmitate, in the methanol fraction is an aliphatic acid ester reported to cause growth inhibition and apoptosis induction in human gastric cancer cells.

Phytol was the main diterpene alcohols in methanol fraction. Phytol in the methanol fractions is a diterpene alcohol which functions as a precursor for Vitamins E and K1 and an antioxidant and a preventive agent against epoxide-induced breast cancer carcinogenesis. It's also an effective vaccine adjuvant with no adverse auto-immune effects (Daniet *et al.*, 2011). Hexadecanoic acid methyl ester, also known as Methyl palmitate, in the methanol fraction is an aliphatic acid ester reported to cause growth inhibition and apoptosis induction in human gastric cancer cells (Anandan *et al.*, 2012).

Table 1: The chemical composition of *Cissus quadrangularis* Linn.

S.No.	R.T	Name	Formula	MW	Peak area (%)
1	4.05	Pentane,1,1-diethoxy-	C <sub>9</sub> H <sub>20</sub> O <sub>2</sub>	160	1.41
2	18.25	3-Dodecanol, 3,3,11-trimethyl-	C <sub>15</sub> H <sub>32</sub> O	228	1.64
3	23.32	Caffeine	C <sub>8</sub> H <sub>10</sub> N <sub>4</sub> O <sub>2</sub>	194	3.20
4	23.78	1,2-Benzenedicarboxylic acid, bis(2-methylpropyl) ester	C <sub>16</sub> H <sub>22</sub> O <sub>4</sub>	278	23.17
5	25.62	Dibutyl phthalate	C <sub>16</sub> H <sub>22</sub> O <sub>4</sub>	278	2.00
6	25.86	n-Hexadecanoic acid	C <sub>16</sub> H <sub>32</sub> O <sub>2</sub>	256	25.63
7	26.40	Hexadecanoic acid, ethyl ester	C <sub>18</sub> H <sub>36</sub> O <sub>2</sub>	284	7.57
8	28.79	Phytol	C <sub>20</sub> H <sub>40</sub> O	296	15.98
9	29.48	Unknown	****	****	14.35
10	29.58	Unknown	****	****	5.05

Fig 1: GC-MS of leaves of *Cissus quadrangularis* Linn.

Caffeine 3,7-dihydro-1, 3, 7-trimethyl-1H-purine-2,6-dione a white powdered, water soluble plant alkaloid, is found in many plant species such as coffee and green tea. Caffeine at submillimolar concentrations exerts a wide variety of physiological effects on different organisms and has long been known to have numerous actions, including inhibition of phosphodiesterases, thereby increasing intracellular cAMP, direct effects on intracellular calcium concentrations, indirect effects on intracellular calcium concentrations via membrane hyperpolarization and antagonism of adenosine receptors (Muhammed and Al-Bayati, 2009). Caffeine one of the methylxanthine compound has long been known to be a natural ingredient present in coffee, tea and cola. It is highly lipophilic compound that can elevate mood; decreases fatigue, relieve tension, relax smooth muscle, bronchial muscle, stimulate CNS and Cardiac muscle and also act as a diuretic (Mukhopadhyay *et al*, 2003.). The common effect of caffeine when taken in high doses is increased metabolic rate, irritability, sleep disturbance and gastrointestinal aches (Ramarethinam *et al*, 2004.).

Thus the results obtained confirm the therapeutic potency of *Cissus quadrangularis* used in traditional medicine. This forms a good basis for the selection of plant for further phytochemical and pharmacological investigation. So present work gives a direction for future investigators to carry out research on the extracts and oil of the plant so that they could get some medicinally important drugs.

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