GC-MS ANALYSIS OF BIOACTIVE CONSTITUENTS OF CARALLUMA TRUNCATO-Coronata (Sedgw.) Graevely & Mayur. (Asclepiadaceae).

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ABSTRACT

In this study, the bioactive compounds of Caralluma truncato-coronata have been evaluated using GC-MS. The chemical compositions of the whole plant ethanol extract of c. truncato-coronata were investigated using Perkin-Elmer Gas Chromatography-Mass Spectroscopy. GC-MS revealed the existence of the major compound Thunbergol (68.05%), Vitamin E (9.45%), Squalene and Lupeol (5.67%), β-Tocopherol (4.91%), Acetic acid,5-(dimethyle-6-oxocyclohexylidene) -3-methyl-pent-3-enyl ester (3.78%), β-Sitosterol(1.89%) and Furan,2-butyltetrahydro- (0.57%). Further isolation and biological screening will be providing the therapeutic potential of the compounds.

INTRODUCTION

Plants are used medicinally in different countries, these plants are expensive gift from nature to human and they are the source of many potent and powerful drugs. Plants have been an important source of medicine with qualities for thousands of years. Mainly on traditional remedies such as herbs for their history, they have been used as popular folk medicines. (Sathyaprabha et al. 2010) It has been shown that in vitro screening methods could provide the needed preliminary observations necessary to elect crude plant extracts with potentially useful properties for further chemical and pharmacological investigations (Mathekaga and Meyer 1998). In the recent past, there has been growing interest in exploiting the biological activities of different ayurvedic medicinal herbs, owing to their natural origin, cost effectiveness and lesser side effects (Naik et al. 2003). Medicinal plants are expensive gift from nature to human. The approval of traditional medicine as an alternative form of health care and the improvement of microbial resistance to the existing antibiotics has lead researchers to scrutinize the antimicrobial compounds (Sumathi, 2010). Herbal medicines are safer than synthetic medicines because the
Phytochemicals in the plant extract target the biochemical pathway. Medicinal plants have been used all over the world for the treatment and prevention of various ailments, particularly in developing countries where infectious diseases are endemic and modern health facilities and services are inadequate (Zaidan et al. 2005). Plant-based natural constituents can be derived from any part of the plant like bark, leaves, flowers, roots, fruits, seeds, etc. (Gordon 2001). The medicinal actions of plants unique to particular plant species or groups are consistent with the concept that the combination of secondary products in a particular plant is taxonomically distinct (Wink et al. 1999). Screening active compounds from plants has lead to the invention of new medicinal drugs which have efficient protection and treatment roles against various diseases (Mukherjee et al. 2007). There is growing awareness in correlating the phytochemical constituents of a medicinal plant with its pharmacological activity (Prachayasittikul et al. 2008).

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Caralluma a genus of cactus plant belongs to the sub family Asclepiadoideae distributed in Africa, Asian, and Southeast European countries (Mabberley, 1993). It is a succulent, perennial herb, grow to a height of 1 to 10 feet and grow in different regions of India. About 13 species and seven varieties of Caralluma occur in India. Among these, eleven species are solely endemic to South India (Jagatap and Singh, 1999). The endangered species are C. bhupenderiana, C. sarkariae, B. truncato-coronata, B. procumbens and B. pauciflora (Nayar, 1996). The juicy stem of C. tuberculata is bitter tonic, febrifuge, stomachic and carminative useful in rheumatism and consumed as vegetable especially when cooked with minced meat (Shinwari et al. 2006). The members of genus Caralluma are erect and fleshy. They have quadrangular stem devoid of leaves and small flowers in several varieties of dark colour. The species of Caralluma found in India are edible and form a part of traditional medical system of country (Al-Yaha and Abdulstar, 2000). Caralluma species have been used for centuries in semi-arid areas of Pakistan as emergency foods (Atal et al. 1980). C. edulis is known for its anti-diabetic properties (Wadood et al 1989) and other Caralluma species for their antihyperglycemic activity (Venktash et al. 2003).

Caralluma is found in dry regions of the world has paramount medicinal importance and has significant anti-inflammatory and antitumor activity (Ramesh et al. 1999; Zakaria et al. 2001). The pregnane glycosides of Caralluma have been shown to possess antitumor and anticancer activities and in some studies. Caralluma is reported to protect gastric mucosa and have antiulcer properties (Zakaria et al. 2002). The plant had been utilized as a traditional anti-diabetic therapeutic agent equally well in both urban and rural population in Pakistan. It was observed that administration of C. siniaca in different doses to healthy animals can cause significant decrease in glucose level (Habibuddin et al 2008). In another report, it was observed
that *C. fimbriata*, can be used in weight reduction (Lawrence & Choudhary, 2004). The extracts of *C. attenuata* and *C. edulis* had hypoglycemic properties and provide synergistic effect in combination with the phlorizin extract which beneficially modify glucose transport, blood and urine glucose level, blood insulin level and helps in weight loss. Plants of *C. tuberculata* have been extensively used for paralysis and joint pain and fever (Khan & Khatoon, 2008).

The photochemistry of genus *Caralluma* is characterized by many pregnane glycosides. *Caralluma* extracts have also been found to be appetite suppressant a property which is well known to Indian tribal and hunters. *C. truncato-coronata* (Sedgw.) Gravely & Mayur., belongs to the sub family Asclepiadoideae is an important indigenous endemic medicinal herb distributed in Coimbatore. Due to uniqueness of curing different ailments this whole plant was selected to analyze the potent bioactive compound from *C. truncato- coronata* by GC-MS.

**Collection and identification of plant materials**

The taxonomically identified *Caralluma truncato-coronata* (Sedgw.) Gravely & Mayur Syn, *Boucerosia truncato-coronata* were collected from the natural habitats of Madukarai, Coimbatore district, Tamil Nadu, India and certified by Botanical Survey of India (BSI), Coimbatore, India (Certificate No. BSI/SRC/5/23/2012-13/Tech.1375). The voucher specimen was deposited in the Department of Botany, Government Arts College (Autonomous) Coimbatore.

**Preparation of extract**

The fresh plant were carefully washed with tap water to remove soil particles and adhered debris, rinsed with distilled water, and air-dried, it was cut into uniformly small pieces and shade dried at room temperature for two weeks, and ground into fine powder. The powdered materials were stored in air tight polythene bags for future use. 20 gram powder was weighed and transferred to flask, treated with the Ethanol until the powder was fully immersed, incubated over night and filtered through a Whatman No.41 filter paper along with sodium sulphate wetted with absolute alcohol. The filtrates were concentrated to 1ml by bubbling nitrogen gas in to the solution. The extract 2µl sample of the extract was employed in GC-MS.

**GC-MS ANALYSIS**

The GC – MS analysis was carried out using a Clarus 500 Perkin – Elmer (Auto system XL) Gas Chromatograph equipped and coupled to a mass detector Turbo mass gold – Perkin Elmer Turbomass 5.2 spectrometer with an Elite – 5MS (5% Diphenyl / 95% Dimethyl poly siloxane), 30 m x 0.25 µm DF of capillary column. The instrument was set to an initial temperature of 110°C, and maintained at this temperature for 2 min. At the end of this period the oven
temperature was rose up to 280ºC, at the rate of an increase of 5ºC /min, and maintained for 9 min. Injection port temperature was ensured as 200 ºC and Helium flow rate as one ml/min. The ionization voltage was 70eV. The samples were injected in split mode as 10:1. Mass spectral scan range was set at 45-450 (m/z). Using computer searches on a NIST Version –Year 2005 were used MS data library and comparing the spectrum obtained through GC – MS compounds present in the plants sample were identified.

RESULTS AND DISCUSSION

The results pertaining to GC-MS analysis led to the identification of number of compounds from the GC fractions of the ethanolic extract of C. nilagiriana. These compounds were identified through mass spectrometry attached with GC. The results of the present study were tabulated in Table 1. The results revealed that the presence of Thunbergol (68.05%), Vitamin E (9.45%), Squalene and Lupeol (5.67%), β -Tocopherol (4.91%), Acetic acid,5- (dimethylene-6-oxocyclohexylidene) -3-methyl-pent-3-enyl ester (3.78%), β-Sitosterol(1.89%) and Furan,2-butyltetrahydro- (0.57%). Lupeol is a pharmacologically active triterpenoid found in a variety of plants, including mango and acacia visco. It has several medicinal properties, one being anti-inflammatory study found lupeol to decrease paw swelling in rats by 39%, compared to 35% for the standardized control compound indomethacin (Geetha and Varalakshmi 2001). Another report lupeol has a complex pharmacology in humans, displaying antiprotozoal, antimicrobial, anti-inflammatory, antitumor and chemopreventive properties. One study has also found some activity as a Dipeptidyl peptidase-4 inhibitor and prolyloligopeptidase inhibitor at high concentrations (Margareth et al. 2009). It is an effective inhibitor in laboratory models of prostate and skin cancers (Marques et al. 2010)

Research has indicated that Stigmasterol is useful in prevention of certain cancers, including ovarian, prostate, breast, and colon cancers. Studies have also indicated that a diet high in phytoesterols may inhibit the absorption of cholesterol and lower serum cholesterol levels by competing for intestinal absorption. Studies with laboratory animals fed Stigmasterol found that both cholesterol and sitosterol absorption decreased 23% and 30%, respectively, over a 6-week period. It was demonstrated that it inhibits several pro-inflammatory and matrix degradation mediators typically involved in osteoarthritis-induced cartilage degradation (Gabay et al. 2010). It also possesses potent antioxidant, hypoglycemic and thyroid inhibiting properties (Panda et al. 2010).

Squalene is a natural organic compound ,Squalene has been proposed to be an important part of the Mediterranean diet as it may be a chemo preventative substance that protects people from cancer (Smith and Theresa 2000) , (Owen, 2004). Vitamin E has many biological functions; the antioxidant function being the most important and/or best known. (Bell, 1987). Vitamin E also
plays a role in neurological functions, (Muller. 2010). Vitamin E also protects lipids and prevents the oxidation of polyunsaturated fatty acids (PUFAs.) (Whitney et al. 2011). So far, most human supplementation studies about vitamin E have used only alpha-tocopherol. This can affect levels of other forms of vitamin E, e.g. reducing serum gamma- and delta-tocopherol concentrations. Moreover, a 2007 clinical study involving alpha-tocopherol concluded that supplementation did not reduce the risk of major cardiovascular events in middle aged and older men (Sesso et al. 2008).

CONCLUSION

In the present study twenty chemical constituents have been identified from ethanolic extract of the whole plant of C. truncato-coronata by Gas Chromatogram Mass spectrometry (GCMS) analysis. The presence of various bioactive compounds justifies the use of whole plant various ailments by traditional practitioners.

REFERENCE


Fig. 1. GC-MS chromatogram of the ethanolic extract of the leaves of *C. truncato-coronata*.
## Table 1: Activity of Phytocomponents Identified in *C. truncato-coronata* by GC-MS

<table>
<thead>
<tr>
<th>No</th>
<th>RT</th>
<th>Name of the compound</th>
<th>Molecular formula</th>
<th>MW</th>
<th>Peak Area %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>14.54</td>
<td>Furan,2-butyltetrahydro-</td>
<td>C(<em>8)H(</em>{16})O</td>
<td>128</td>
<td>0.57</td>
</tr>
<tr>
<td>2</td>
<td>24.13</td>
<td>Squalene</td>
<td>C(<em>{30})H(</em>{50})O</td>
<td>410</td>
<td>5.67</td>
</tr>
<tr>
<td>3</td>
<td>27.10</td>
<td>β-Tocopherol</td>
<td>C(<em>{28})H(</em>{48})O(_2)</td>
<td>416</td>
<td>4.91</td>
</tr>
<tr>
<td>4</td>
<td>28.39</td>
<td>VitaminE</td>
<td>C(<em>{29})H(</em>{50})O(_2)</td>
<td>430</td>
<td>9.45</td>
</tr>
<tr>
<td>5</td>
<td>28.98</td>
<td>Acetic acid,5-(dimethyle-6-oxocyclohexylidene) -3-methyl-pent-3-enyl ester</td>
<td>C(<em>{16})H(</em>{24})O(_3)</td>
<td>264</td>
<td>3.78</td>
</tr>
<tr>
<td>6</td>
<td>29.41</td>
<td>Thunbergol</td>
<td>C(<em>{20})H(</em>{34})O</td>
<td>290</td>
<td>68.05</td>
</tr>
<tr>
<td>7</td>
<td>31.47</td>
<td>β-Sitosterol</td>
<td>C(<em>{29})H(</em>{50})O</td>
<td>414</td>
<td>1.89</td>
</tr>
<tr>
<td>8</td>
<td>33.22</td>
<td>Lupeol</td>
<td>C(<em>{30})H(</em>{50})O</td>
<td>426</td>
<td>5.67</td>
</tr>
</tbody>
</table>