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# ANTIOXIDANT ACTIVITY AND GC-MS ANALYSIS OF *CUCUMIS SATIVUS* PEEL EXTRACT

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**Abstract**

Medicinal plants improve the health and safety of the local population in addition to supplementing or replacing contemporary medical therapies, which are frequently insufficiently available. The primary goals of this study were to assess the antioxidant activity and perform GC-MS analysis on several *Cucumis sativus* peel extracts. The DPPH radical scavenging activity results demonstrated that the methanol peel extract of *Cucumis sativus* had $IC_{50}$ ranges of 28µg, in contrast to 24µg and 36µg for the control ascorbic acid and aqueous extract, respectively. The results of the GC-MS analysis revealed that 15 bioactive compounds in total were detected. The primary components are diterpenes (Phytol), alkaloids (cis stereoisomer of 1-(6-Methyl-piperidyl)propan-2-one), phytosterols (Ergosta-5,7-dien-3-ol), and long chain hydrocarbons (Heptadecane, Heptacosane, Nonadecane). Thus, the presence of phytochemicals is what gives them their medicinal advantages. Further research is required to perhaps develop new treatments using some of the bioactive compounds found in *Cucumis sativus.*

Keywords: *Cucumis sativus,* Phytochemicals, Antioxidant and GC- MS analysis.

## 1 Introduction

Traditional medicine, according to the WHO is the entirety of knowledge and methods that can be formally explained or applied in the prevention and treatment of physical, mental, or social imbalances, with a sole reliance on firsthand experience and observation that is verbally or in writing passed down from generation to generation. With the exception of western nations, between 75 and 90 percent of rural people worldwide only have access to traditional medicine. This is due to a variety of factors, including poverty, which prevents people from affording pricey contemporary medications, and the fact that traditional methods are more culturally acceptable and better address psychological demands than modern medicine [1].

Antioxidants, which are extremely important chemical substances, bind these free radicals and lessen and shield us from their damaging effects on the body's regular cells. While natural antioxidants are harmless and have few negative effects, some artificially created antioxidants, including butylated hydroxyl-toluene and butylated hydroxyl-anisole, are readily available on the market and are less stable. Antioxidants have ideally been sourced from natural materials for safety concerns. Natural food sources such as fruits, vegetables, seeds, herbs, sprouts, edible mushrooms, and cereals can serve as effective sources of antioxidants to reduce the negative effects and damage caused by free radicals [2].

The method most frequently used for identifying and quantifying the chemicals in extracted materials is gas chromatography mass spectroscopy. By interpreting the spectrum and comparing it to reference spectra, one can identify the unknown chemical compounds present in a complex mixture. Of particular interest were the antioxidants, which are compounds that, when present in foods or the body in small amounts, significantly delay or prevent the oxidation of oxidizable substrate [3]. When identifying different compounds from plant extracts, such as alkaloids, flavonoids and amino acids. GC-MS is a dependable method. Additionally, advanced drug discovery techniques have been developed using computer-based technologies, which can be utilized to screen medications from bioactive chemicals found in medicinal plants.

The plant family *Cucurbitaceae*, sometimes referred to as the gourd family, is comprised of melons, cucumbers, squash, and lugabas. Curries are a significant and diverse class of vegetable crops that are widely grown in tropical and subtropical regions of the world. There are roughly 118 genera and 825 species in the family. This family of plants offers a wealth of health and nutritional advantages. One of the monoecious annual crops in the *Cucurbitaceae* family, cucumber (*Cucumis sativus* L.) has been domesticated by humans for more than 3,000 years [4].

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## 2. Experimental design:

### 2.1. Collection of Vegetable

The fresh vegetable of *Cucumis sativus* will be purchased from a local market in Tirupattur and used for the study. These vegetables are washed thoroughly with distilled water to devoid of any impurities.

The skin of cleaned cucumber was peeled off carefully with a skin peeler. The peeled skin is shade dried for dehydration for about a week. The completely dried skin is made in to a fine powder using electric mixing grinder.

The ground powder is sieved stored in an air tight container and used whenever it was needed. The Fig1 shows the *Cucumis sativus* Peel and Peel powder is below,

5 g of peel powder with 50ml of MEOH +5 g of peel powder with 50ml of AQ

↓

Store it in a cold, dark area for 2 days.

↓

These extracts are filtered into a sterile Conical Flask after two days.

↓

Antioxidant Activity [Elizabeth and Rao, 2005]

↓

GC – MS Analysis

**Fig1: *Cucumis sativus* Peel and Peel Powder**

### 2.2. *In vitro* Antioxidant activity of AQCsP and MECsP

#### 2.2.1. DPPH radical scavenging assay

This was assayed as described by Elizabeth and Rao [5]. The reaction mixture prepared containing 50ml of Methanol. DPPH (Diphenyl-2-picryl hydrazyl radical)-1mM 3 ml of 1mM DPPH in methanol was added to 100µl of peel extracts with concentrations ranging from 20µl, 40µl, 60µl,80µl and 100µl. DPPH solution with methanol was used as a positive control (ascorbic acid) and methanol alone acted as a blank. When DPPH reacts with antioxidant in the sample and the color changed from deep purple to light yellow. This was measured calorimetrically at 518 nm. The percentage for scavenging activity was calculated by the following formula: Scavenging activity (%) = A518 (control)-A518 (sample)/X 100 A518 (control).

### 2.3. GC-MS Analysis of MECsP

The peel sample usually evaluated the occurrence of phytocompounds by Gas chromatograph (GC) Mass spectrometer (MS). The profile is identified by Bishop Heber College, Heber Analytical instrumentation Facility, Tiruchirappalli, India.

GC-MS techniques is a thermo trace with a fused silica capillary (DB-5MS) column length Thirty meter, diameter 0.25mm (outside and inside), ultra equipped and interfaced to a Mass Selective Detector with XCALIBUR software. Gas chromatograph (GC) Mass spectrometer (MS) are usually electron construction with ionization dynamism of Helium gas (-70eVoltage) and flow rate (1ml/min), sample 2µl, temperature 80° to 200°C, isothermal (1min finally) temperature was kept at 250°C and run time at 40 minutes. The Phytoconsituents was pointed out as percentage (%) with peak area and Identification extract of the compounds was consigned by the comparison of retention time with mass spectra fragmentation patterns in NIST library were respectively.

## 3. Results and Discussion:

### 3.1. Antioxidant activity of AQCsP and MECsP

Antioxidants shield cells from the harm that free radicals can cause. It has been demonstrated that antioxidants can stop or slow down the oxidation of other substances. By eliminating radical intermediates and oxidizing themselves, they have the power to stop chain reactions and prevent oxidation processes. The body is full of materials that can minimize the harm caused by free radicals or prevent their creation. Foods and medicinal plants are rich sources of natural antioxidants.

These plant-based antioxidants, particularly carotenoids and polyphenols, have a variety of biological impacts. In order to investigate prospective sources of antioxidants and promote their use in functional foods, medications, and food additives, it is essential to extract antioxidants from food and medicinal plants effectively and evaluate them appropriately [6]. The DPPH radical scavenging activity results demonstrated that the methanol peel extract of *Cucumis sativus* had IC50 ranges of 28µg, in contrast to 24µg and 36µg for the control ascorbic acid and aqueous extract, respectively. The *Cucumis sativus* antioxidant activity is displayed as follows in Fig 2. These extracts have been shown to be potent DPPH radical scavengers.

According to Sudha *et al.* [7], the concentration of the sample and standard that resulted in the inhibition of 50% of free radicals was utilized to compute the IC50

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values. The antioxidant activity of *R. tomentosa* extracts was examined using the DPPH radical scavenging mechanism. One free radical compound that is commonly used to evaluate the scavenging activity of different kinds of samples of free radicals is called DPPH. The approach offers the benefits of being rapid, easy, and affordable as well as giving first-hand data on the test system's total antioxidant capacity [8].

According to Wang *et al.* [9], the capacity of samples to remove or scavenge free radicals that have changed color from purple to yellow due to hydrogen radical donating ability is classified as primary antioxidant DPPH radical scavenging activity. The scavenging capacity of ethanol, methanol, and aqueous extracts was concentration-dependent.

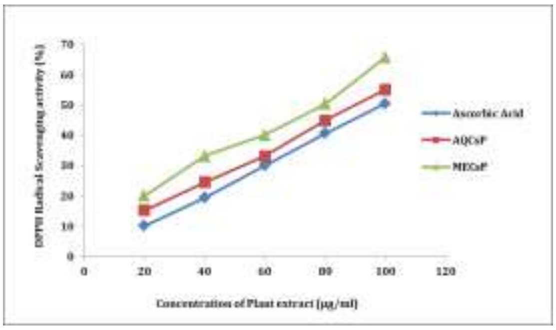


**Fig 2: The Antioxidant activity of AQCsP and MECsP**

### 3.2. Gas chromatography-mass spectroscopy profiling of AQCsP and MECsP

The results of the GC-MS analysis revealed that 15 bioactive compounds in total were detected. The primary components are diterpenes (Phytol), alkaloids (cis stereoisomer of 1-(6-Methyl-piperidyl)propan-2-one), phytosterols (Ergosta-5,7-dien-3-ol), and long chain hydrocarbons (Heptadecane, Heptacosane, Nonadecane). The Fig 3 and Table 1 shows the Gas Chromatogram of MECsP extract are follows,

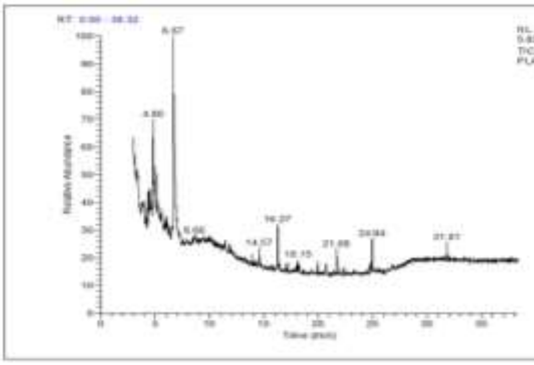

**Fig 3: Gas Chromatogram of MECsP**

The chemicals found in the *P. roxburghii* fruit peel extract, as determined by GC-MS analysis, support the traditional practitioners' usage of fruit peel. Nevertheless, since the found compounds have been shown to have significant bioactivity in the past, isolating each individual component and exposing it to biological activity would undoubtedly produce positive results [9].

**Table 1: Phytochemical Constituents of MECsP Identified By GC-MS Analysis**

| Retention time | Compounds name | Area (%) | Molecular formula | Molecular Weight |
|---|---|---|---|---|
| 6.69 | Heptacosane | 30.27 | $C_{27}H_{56}$ | 380 |
| 4.82 | Heptadecane | 10.54 | $C_{17}H_{36}$ | 240 |
| 3.97 | Ergosta-5,7-dien-3-ol | 8.95 | $C_{28}H_{46}O$ | 398 |
| 16.27 | S-Methyl 2-methylpropanethioate | 6.57 | $C_5H_{10}OS$ | 118 |
| 24.94 | Phytol | 6.56 | $C_{20}H_{40}O$ | 296 |
| 3.32 | Methyl –(2E,5S,7R) 7-benzyloxy-5-Hydroxy- 2,9-decadienate | 5.79 | $C_{18}H_{24}O_4$ | 304 |
| 5.98 | Nonadecane | 4.11 | $C_{19}H_{40}$ | 268 |
| 18.15 | 2-H exenoic acid, ethyl ester | 3.11 | $C_8H_{14}O_2$ | 142 |
| 4.38 | 1,1,1,3,3,5,5,7,7-Nonamethyltetrasiloxane | 2.76 | $C_9H_{28}O_3Si_4$ | 296 |
| 31.81 | Bis (2-ethyl hexyl) phthalate | 2.35 | $C_{24}H_{38}O_4$ | 390 |
| 5.60 | Cis stereoisomer of 1-(6-Methyl-piperidyl)propan-2-one | 2.34 | $C_9H_{17}NO$ | 155 |
| 20.71 | Heptyl 2-hydro perfluorooctanoate | 2.01 | $C_{15}H_{16}F_{14}O_2$ | 494 |
| 8.66 | Phenyl4[bis(ethoxycarbonyl)but-3-ynyl]-2,3,4-trideoxy-à,L-glcero-pent-2-enopyranoside | 1.21 | $C_{21}H_{26}O_6$ | 374 |
| 37.87 | Arsenousacid, tris(trimethylsilyl) ester | 1.15 | $C_9H_{27}AsO_3Si_3$ | 342 |
| 9.46 | 1-Heptacosanol | 0.98 | $C_{27}H_{56}O$ | 396 |

Many methods for separating and identifying active bio compounds from various plant sections have been developed recently. Gas chromatography-mass spectrometry (GC–MS) is a practical and widely used method for analyzing aromas, including volatile organic chemicals and the odor or off-flavor of food.

By comparing the fragments of the target compounds with the database of standard compounds that is available in the GC-MS system, the GC-MS approach is an effective means of learning about the structure of volatile compounds [10]. The goal of this study was to gather detailed information about the volatile chemical content of the fruit peel and pulp from Foshou. The peel of the Foshou fruit, in particular, had a notably higher concentration of volatile aromatic chemicals than the remainder of the citrus fruit. This was a noteworthy observation about the fruit. Based on the study's findings, we can say that Foshou fruit has a lot of volatile substances that could be used in a variety of businesses besides food [11].

**4. Conclusion:**

The results of the DPPH radical scavenging activity showed that the *Cucumis sativus* methanol peel extract had $IC_{50}$ ranges of 28μg, whereas the aqueous extract and control ascorbic acid had $IC_{50}$ ranges of 24μg and 36μg, respectively. The GC-MS analysis's findings showed that a total of 15 bioactive chemicals were found. Diterpenes (Phytol), phytosterols (Ergosta-5,7-dien-3-ol), alkaloids (cis stereoisomer of 1-(6-Methyl-piperidyl)propan-2-one), and long chain hydrocarbons (Heptadecane, Heptacosane, Nonadecane) are the main constituents.

The GC-MS study identified these fifteen phytochemical components, which support antibacterial, anticancer, hypercholesterolemic, anti-inflammatory, and other activities. Thus, the presence of phytochemicals is what gives them their medicinal advantages. Further research is required to perhaps develop new treatments using some of the bioactive compounds found in *Cucumis sativus*.

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**Conflict of Interest:** Nil

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