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# GC–MS Analysis of Bioactive Compounds Present in Ethanol Extract of *Panicum Maximum (Jacq)* Leaves

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**ABSTRACT**

Phytoconstituents present in the ethanolic extract of *Panicum maximum* leaves were explored by Gas Chromatography-Mass Spectrometry analysis. The compounds were identified by the gas chromatography coupled with the mass spectrometry. The molecular weight and structure of the compounds of *Panicum maximum* leaves were ascertained by interpretation of the spectrum of GC-MS using the database of National Institute of Standard and Technology (NIST). GC-MS analysis of *Panicum maximum* leaves revealed the presence of nineteen biological active compounds. The compounds are benzenamine, 4,4'-[2-(4-nitrophenyl)ethenylidene]bis[N,N-dimethyl-, cyclopropanecarboxylic acid, 1-(phenylmethyl)-, 2,6-bis(1,1-dimethylethyl)-4-methylphenyl ester, [4,5'-bipyrimidine]-2,2'-diamine, 4',6-dimethoxy-N,N,N',N'-tetramethyl-, 12-Hydroxystearic acid, phenacyl ester, azadirachtin, de[(E)-2-methyl-1-oxo-2-butenyl](1,2-dioxopropyl)dihydro-, tricyclo[3.3.1.1(3,7)]decane, 1,2,2,3,4,4,6,6,8,8,9,9,10,10-tetradecafluoro-5,7-bis(trifluoromethyl)- , spiro[cyclohexane-1,3'-[3H]indole]-2'-carboxy-o-toluidide, 7'-methyl-, 1,3,5-triazine-2,4,6-triamine, N',N''-bis(3-aminophenyl)-N,N-diphenyl-,4''-dehydroxy-2'',3',3'',4',5,6'',7-hepta-O-methylisoorientin, 9,10-anthracenedione, 1,4-bis[(2-ethyl-6-methylphenyl)amino]- , l-valine, n-heptafluorobutyryl-, heptadecyl ester, pyrimido[5,4-d]pyrimidine, 4,8-di-m-anisidino-2,6-diethoxy- , 2,3,7,7,12,13,17,18-Octaethyl-21H,23H-porphine-8-one, 6-fluoro-2-trifluoromethylbenzoic acid, 2-formyl-4,6-dichlorophenyl ester, 2-hydroxyskatole, benzo[f]cyclopenta[a]quinolizine-6,7,7a,8,9,10(8H)-hexacarboxylic acid, 6,7-dihydro-, hexamethyl ester, ethyl 2-butyl-3-[[(ethoxycarbonyl)methyl]amino]crotonate , quinoxaline, 2,3-dimethyl-, 4H-1-benzopyran-4-one, 5,6-bis(acetyloxy)-2-[3-(acetyloxy)-4-methoxyphenyl]-3,7-dimethoxy- It was concluded that the bioactive compounds support the use of *Panicum maximum* leaves in the treatment of diseases like cancer, diabetes and hypertension.

***KEYWORDS:*** *Ethanol, gas chromatography, mass spectra, Panicum maximum, plant*

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## INTRODUCTION

Plant source is the oldest source of drugs. Most of the drugs in ancient times were derived from plants. Almost all parts of the plants are used in the treatment of diseases. *Panicum maximum* is a perennial, tufted grass with a short, creeping rhizome. The stems of this robust grass can reach a height of up to 2 m. As the stems bend and nodes touch the ground, roots and new plants are formed. The leaf sheaths are found at the bases of the stems and are covered in fine hairs. It remains green until late into winter. The leaf blades are up to 35 mm wide and taper to a long fine point. The inflorescence is a large multi-branched, open panicle with loose, flexuous branches. The lower branches of the inflorescence are arranged in a whorl. The lower floret is usually male with a well-developed palea (upper bract enclosing flower) [1]. The fertile (female) upper lemma is pale. Spikelets are green to purple and flowering occurs from November to July [2].

*Panicum maximum* is one of the nutritious forage and pasture grass in the tropics [3,4]. The anti-diabetic and antibacterial activities of ethanol leaf extract have been reported. [4,5]. In West Africa, extract form leaf has been used in curing various diseases such as malaria, infections, rheumatism pain, inflammation and diabetes, traditionally [4,5]. The anti-diabetic, antiplasmodial and analgesic activities of the extract have also been reported [6]. The ethanolic leaf extract possess anti-inflammatory and antipyretic properties [7]. The antibacterial activity of, *Panicum maximum* leaf on selected bacterial strains compared well with the standard drug ciprofloxacin

GC-MS analyses have been used by many researchers to identify compounds in plants [8 -10]. Analysis of bioactive phytochemicals present in the leaves of *Panicum maximum* was carried out for future reference studies on a common weed in Nigeria. There are no published literatures that demonstrate the compounds present in the ethanol extracts of *Panicum maximum* leaves by gas chromatography–mass spectrometry analysis. This study is aimed to investigate the

compounds present in the *Panicum maximum* leaves by GC–MS analysis.

## MATERIALS AND METHODS

### Plant sample

Fresh *Panicum maximum* leaves were harvested from Ohafia, Abia State Nigeria on 24th June, 2020. The leaves were identified by a Botanist at the Department of Plant Science and Biotechnology, College of Natural Sciences, Michael Okpara University of Agriculture, Umudike, Nigeria.

### Extraction of crude extracts

The *Panicum maximum* leaves were air dried at room temperature for 3 days. The dried roots were grounded using Wiley Mill Model No. 2 (Arthur H. Thomas Co., Philadelphia, USA). The powdered *C. hispidum* roots were subjected to extraction using ethanol. The extract was then evaporated to dryness using Heidolph Rotavapor (Germany).

### GC-MS Analysis

The GC–MS analysis of bioactive compounds of *Panicum maximum* leaves extracts was done using agilent 6890N gas chromatography equipped with an auto sampler connected to an agilent Mass Spectrophotometric Detector. A micro-litre of sample was injected in the pulsed spitless mode onto a 30m x 0.25 mm ID DB 5MS coated fused silica column with a film thickness of 0.15 micrometer. Helium gas was used as a carrier gas and the column head pressure was maintained at 20 psi to give a constant of 1ml/min. Other operating conditions were preset. The column temperature was initially held at 55 °C for 0.4 min, increased to 200 °C at a rate of 25 °C/mins, then to 280 °C at a rate of 8 °C/mins and to a final temperature of 300 °C at a rate of 25 °C/mins, held for 2 mins . The identification time was based on retention time. Components with lower retention time eluted first before the ones of higher retention time.

### Identification of chemical constituents

The molecular weight and structure of the compounds of test materials were ascertained by the interpretation of mass spectrum of GC-MS using the database of National Institute of Standard and Technology (NIST). The mass spectra of the unknown compounds were compared with the spectra of the known compounds stored in the NIST library.

## Results and Discussion

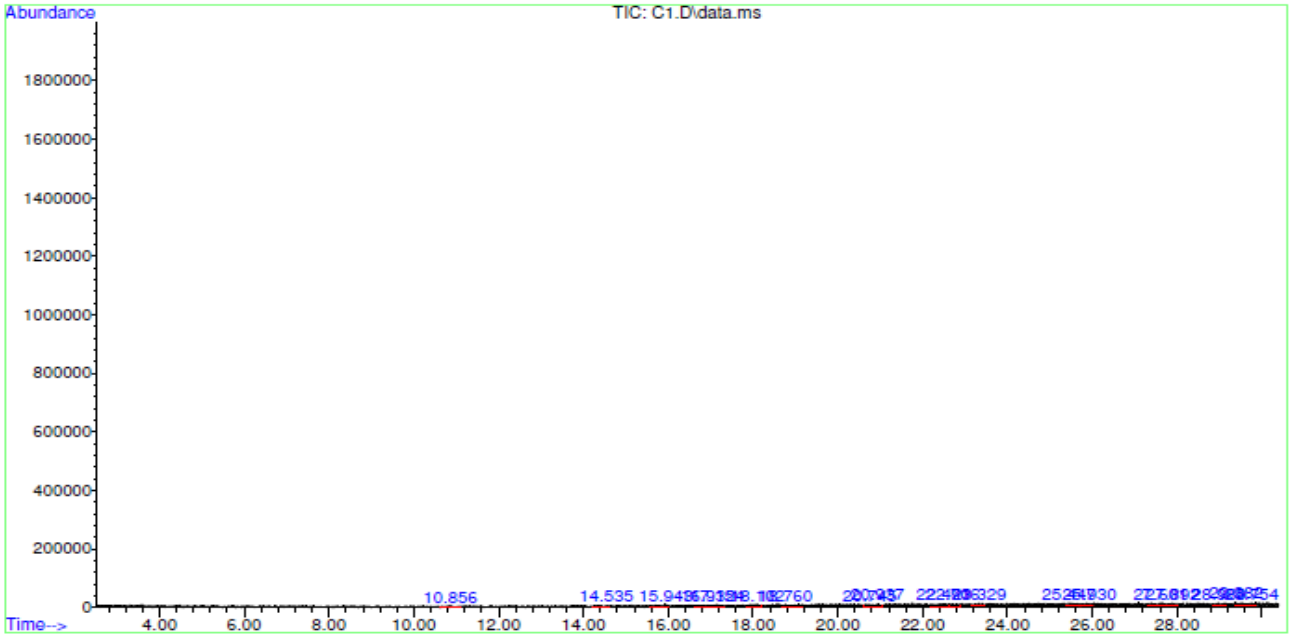
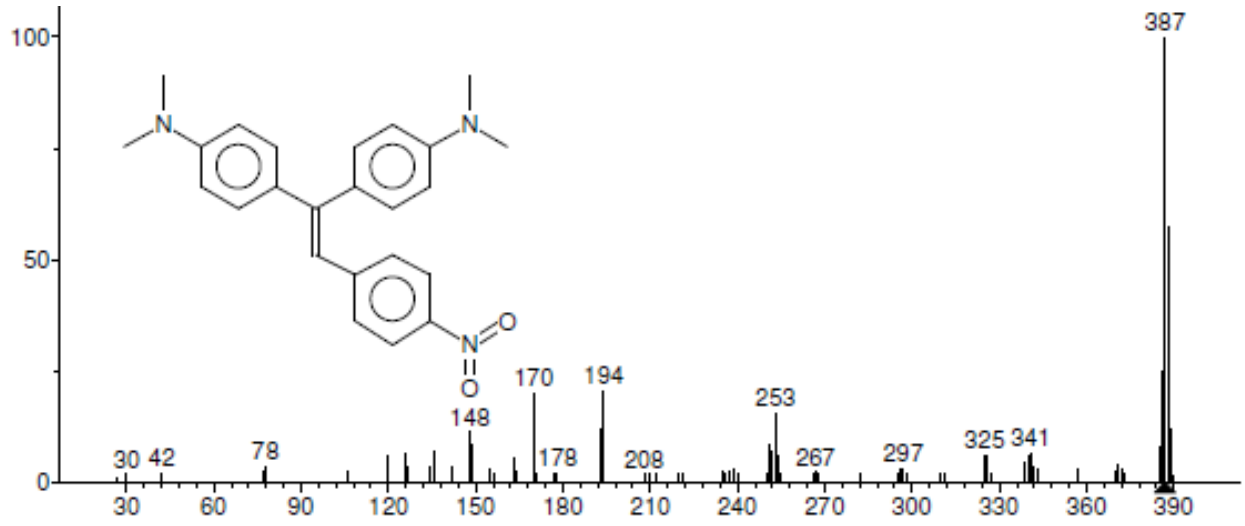
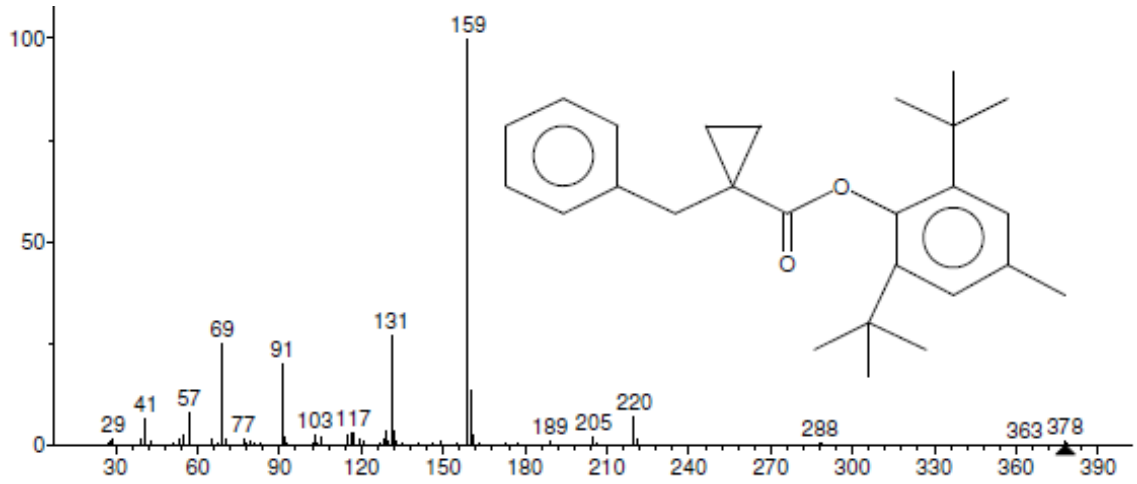
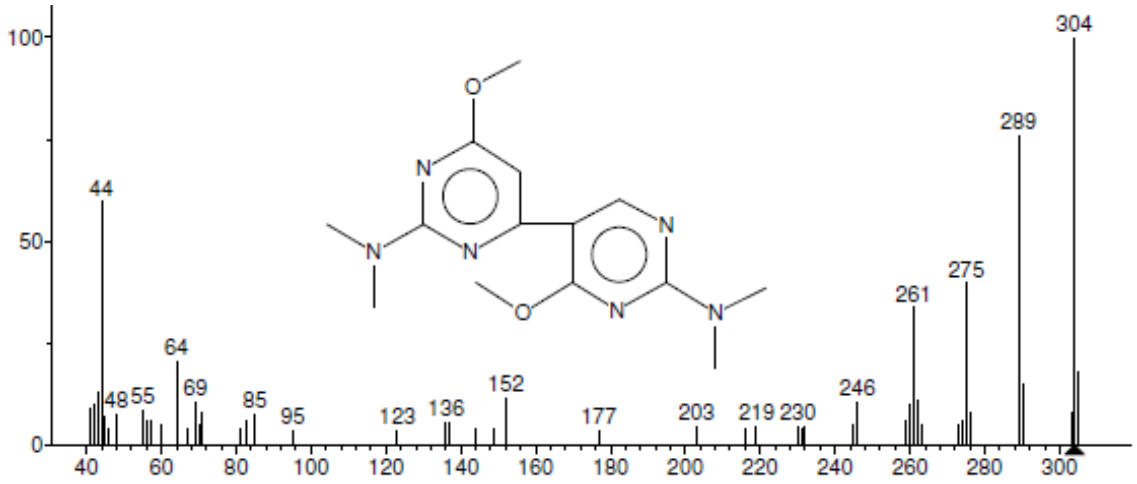


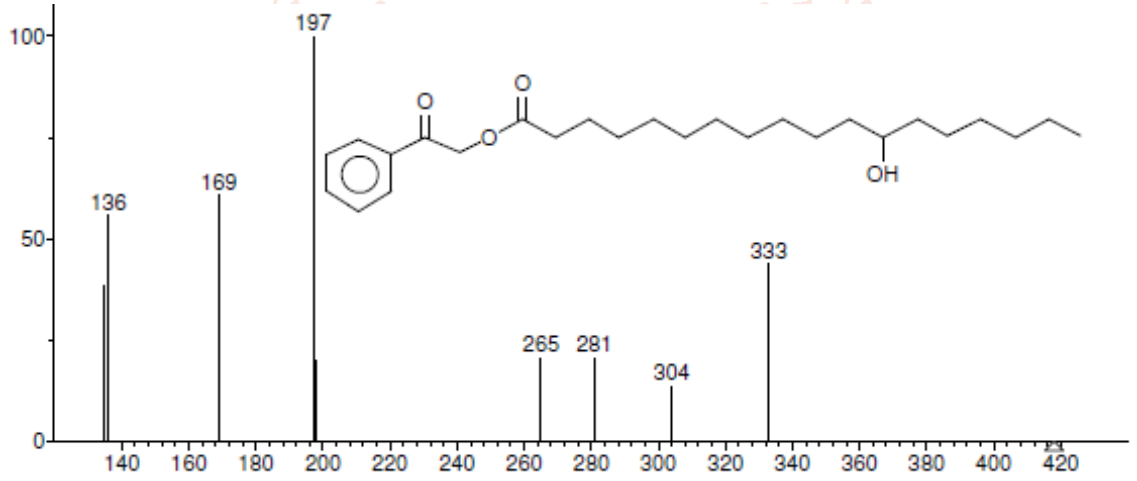

**Figure 1: Gas chromatogram of *Panicum maximum* ethanol leaves extracts**

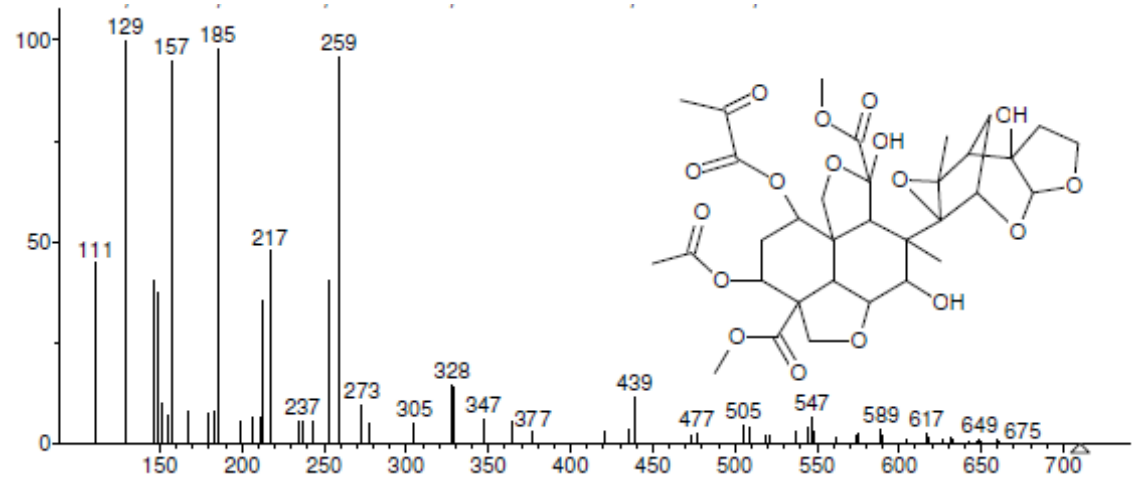


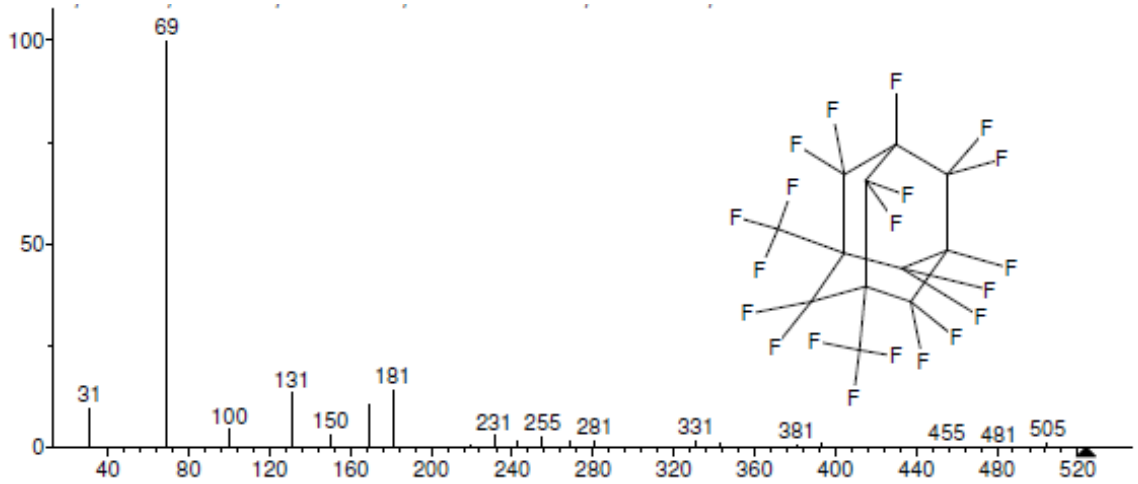


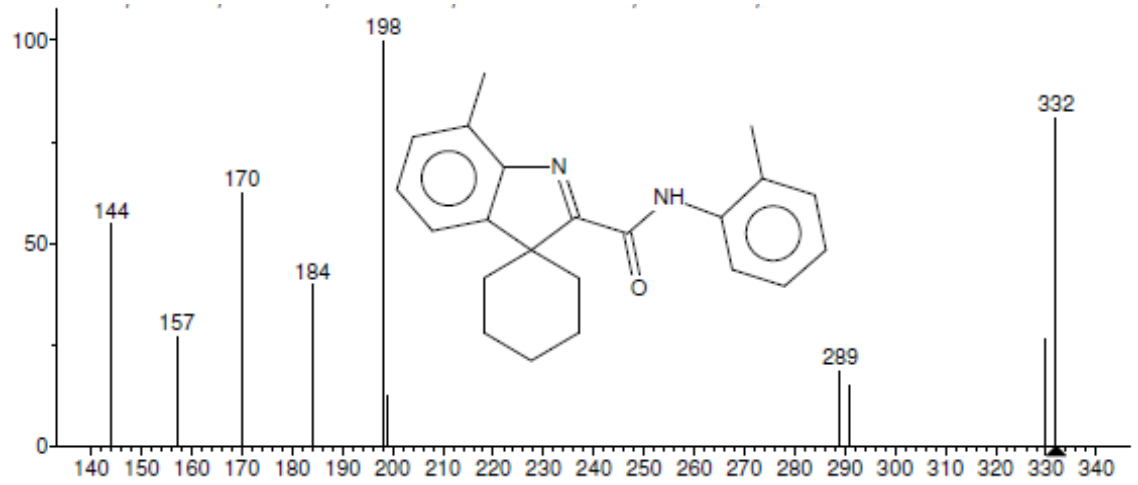





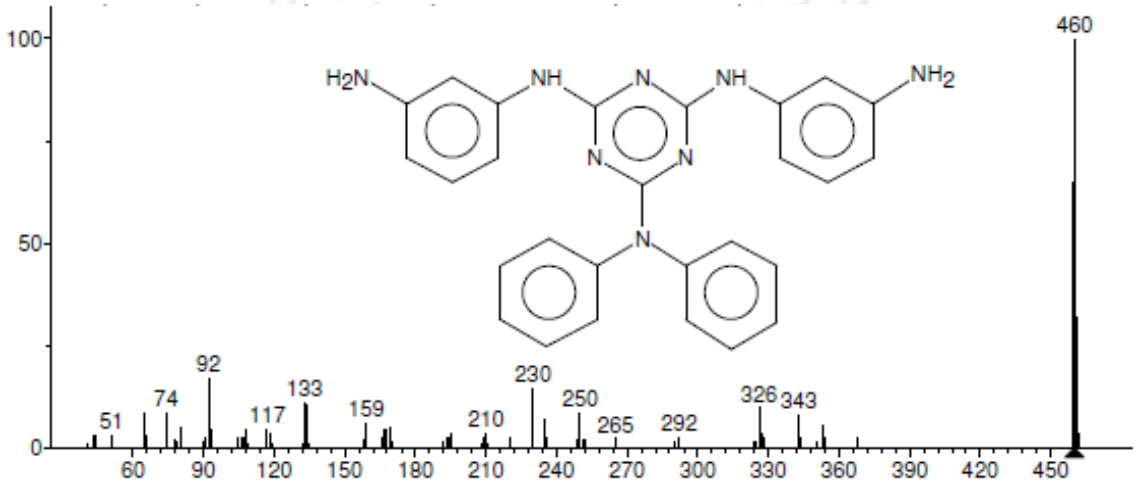



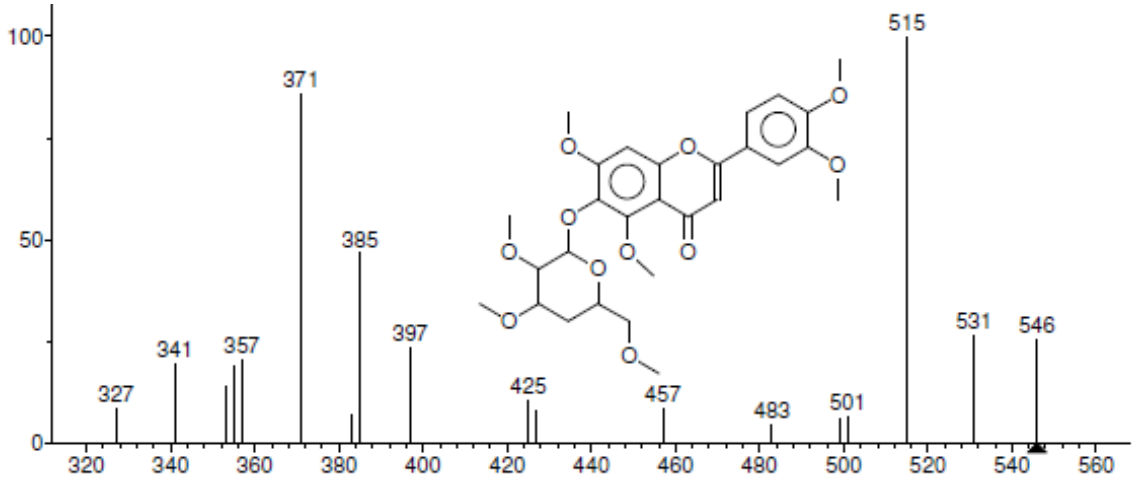



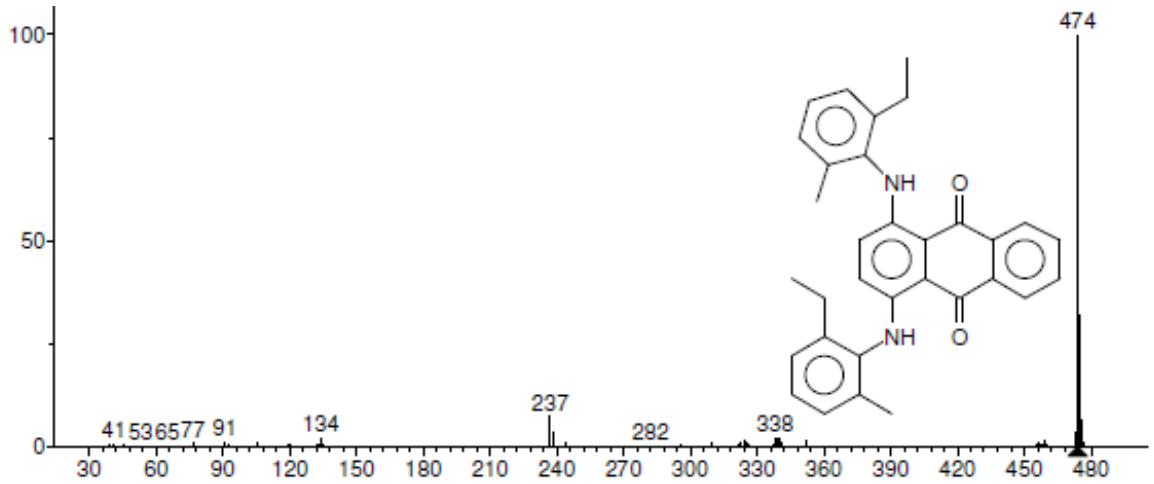


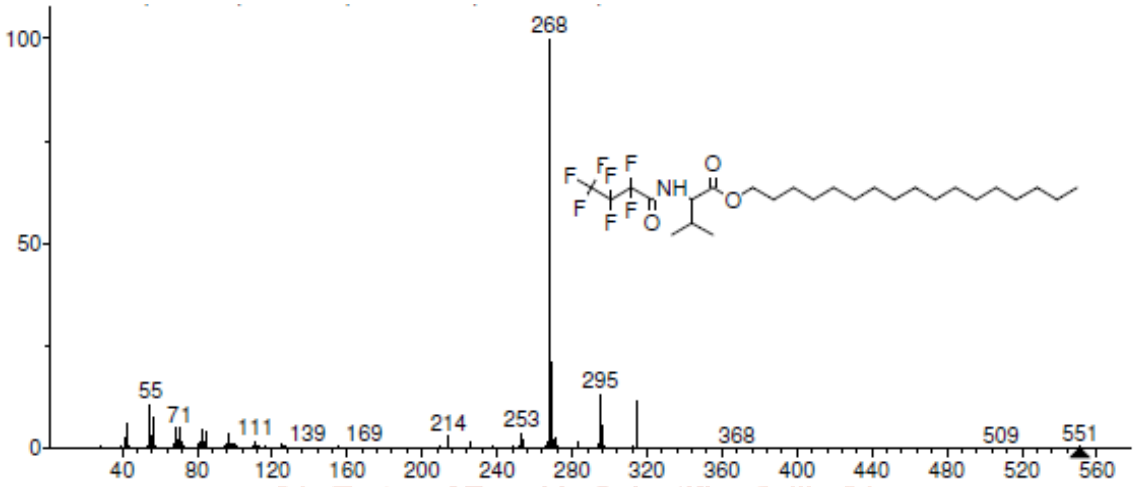





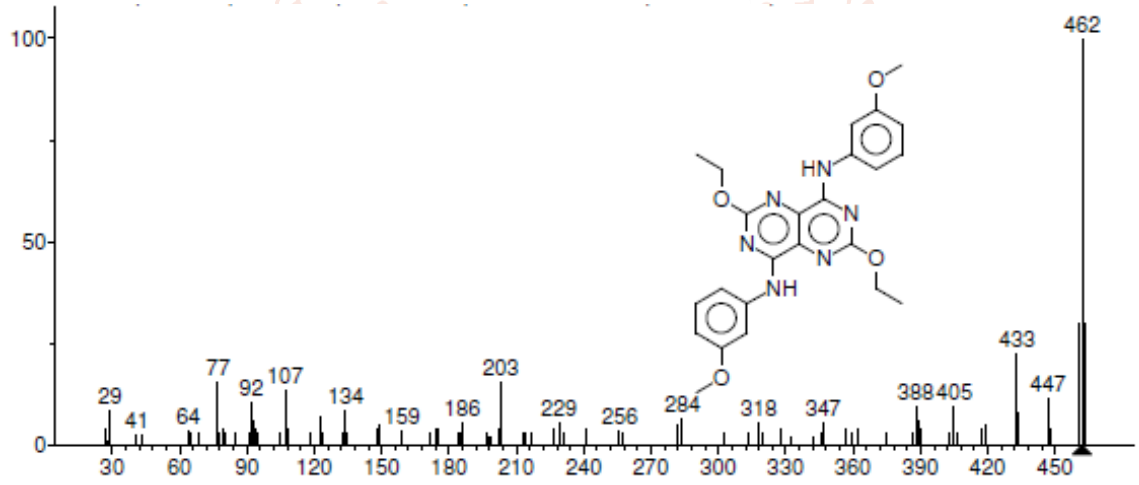



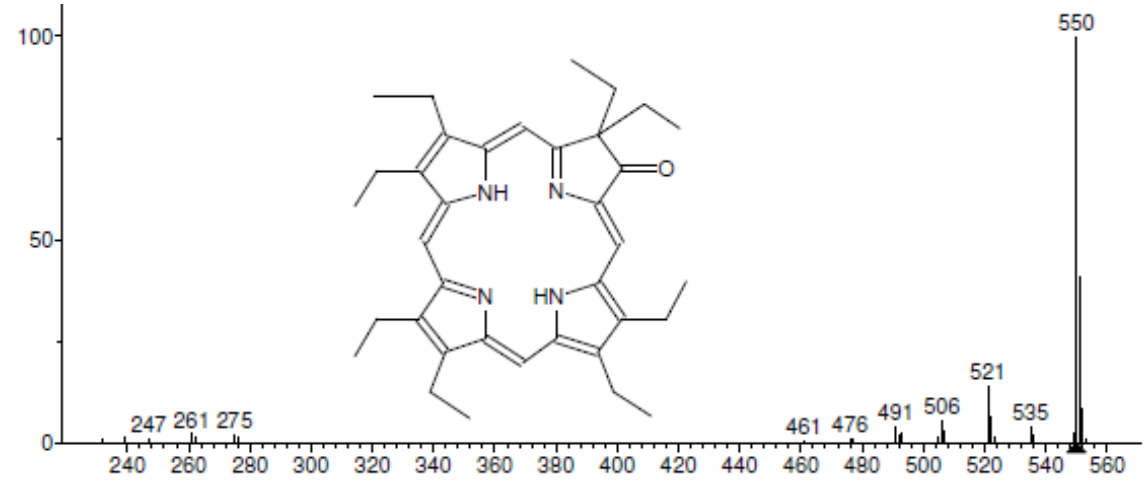



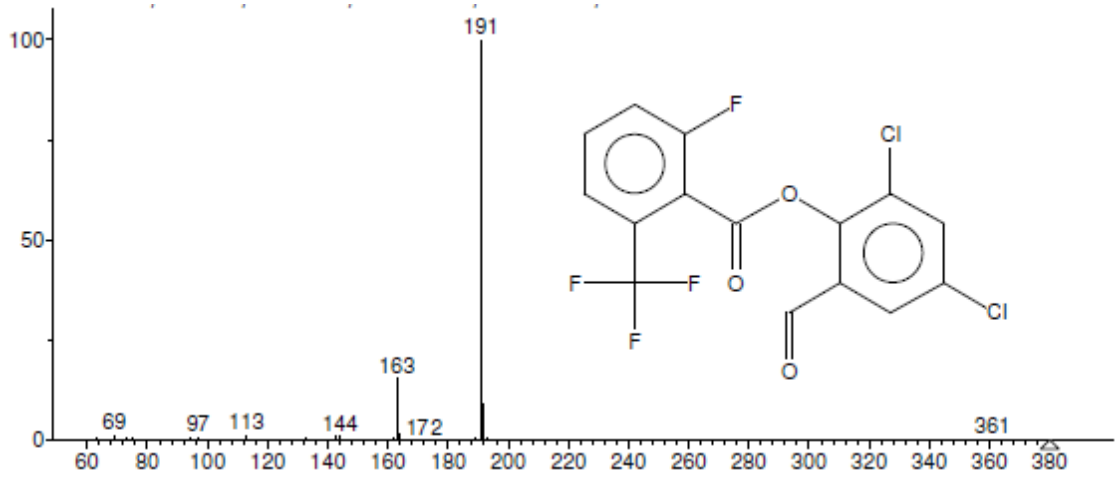


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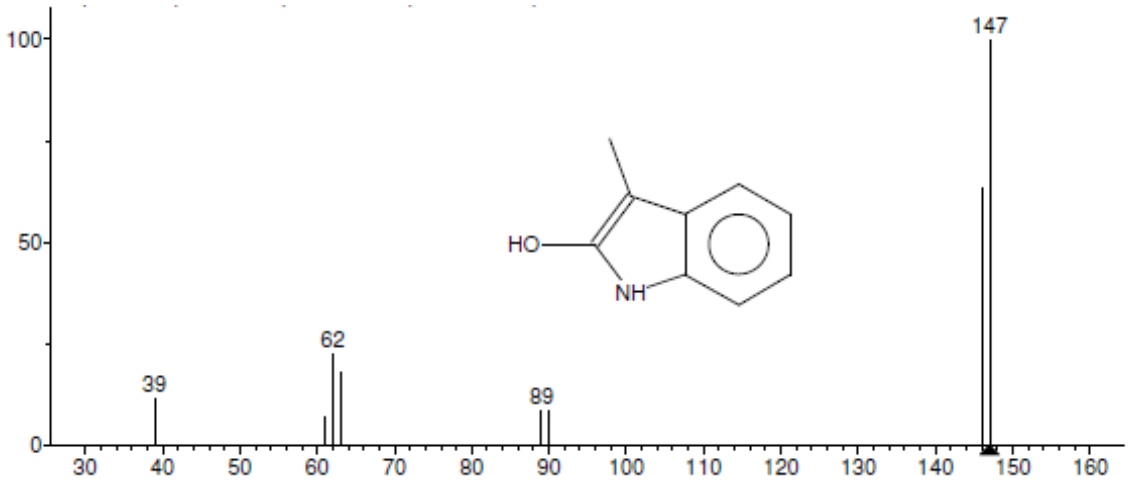
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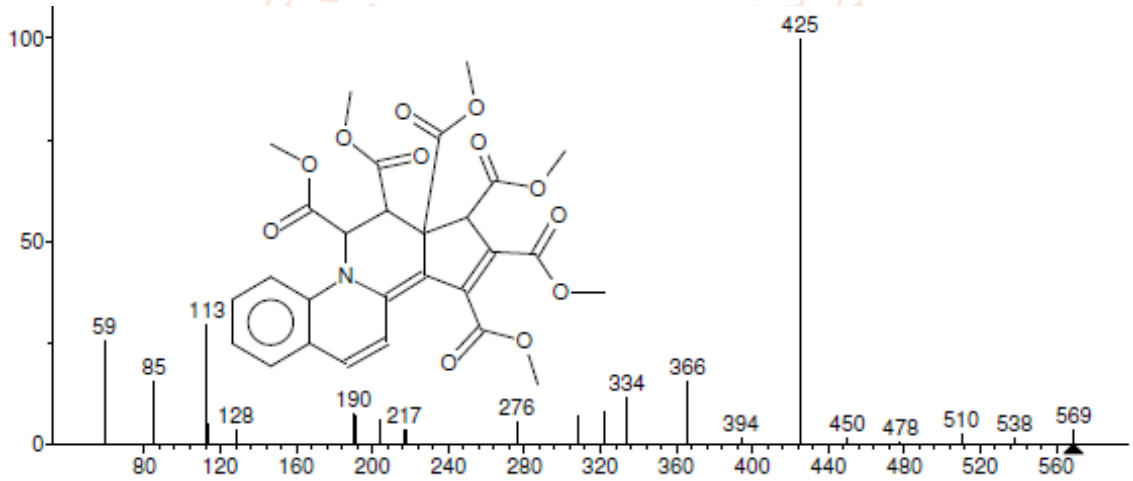
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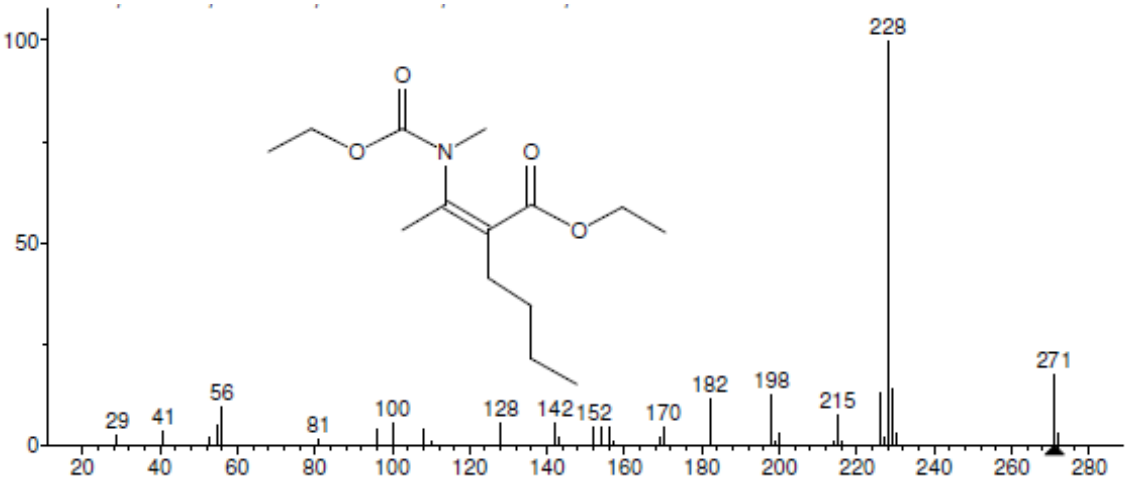
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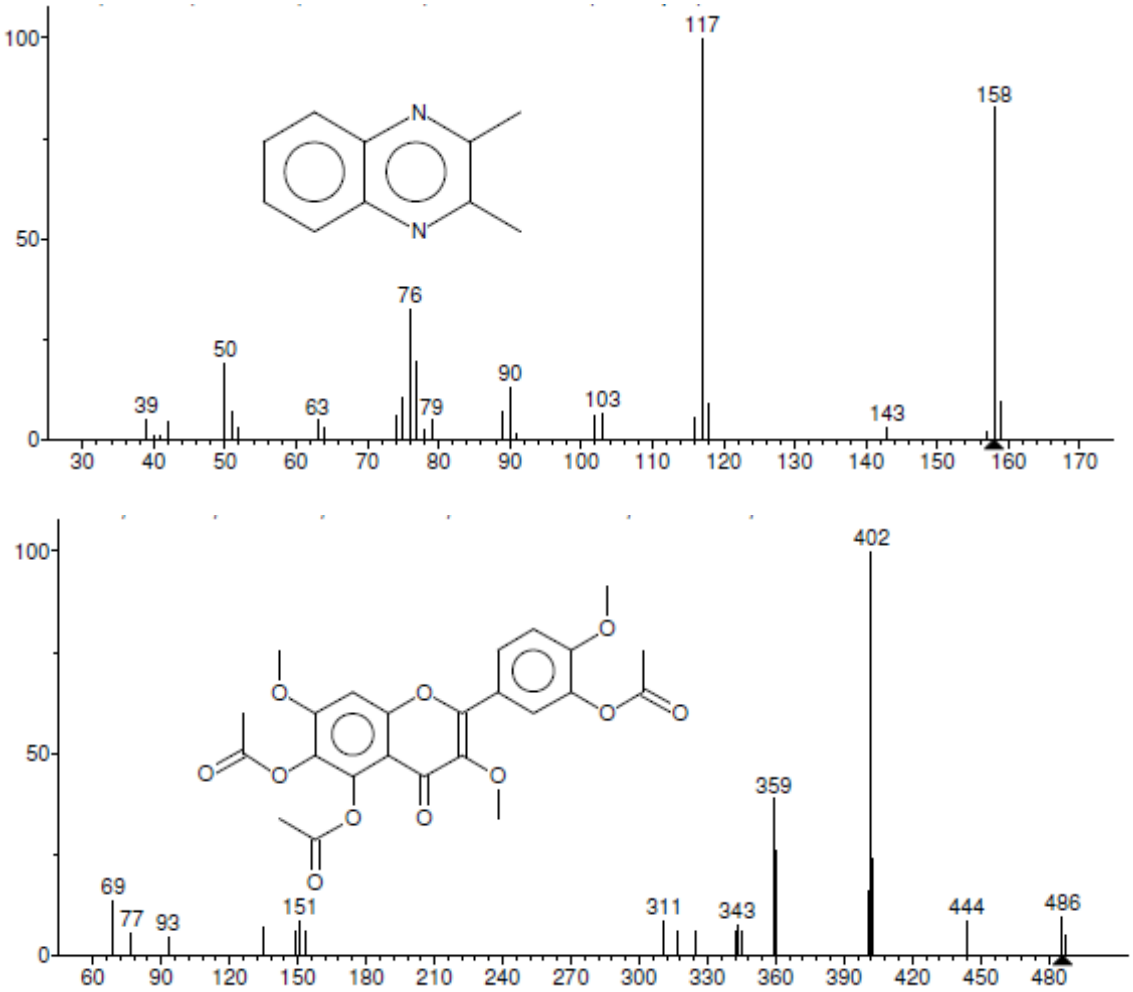


**Figure 2: Mass spectra of *Panicum maximum* ethanol leaves extracts**

**Table 1: Bioactive compounds present in ethanol extracts obtained from *Panicum maximum* leaves**

| S/No | Compound | Bioactivity |
|---|---|---|
| 1 | benzenamine, 4,4'-[2-(4-nitrophenyl)ethenylidene]bis[N,N-dimethyl- | Not found |
| 2 | Cyclopropanecarboxylic acid, 1-(phenylmethyl)-, 2,6-bis(1,1-dimethylethyl)-4-methylphenyl ester | Arachidonic-Acid-Inhibitor, Catechol-O-methyltransferase inhibitors |
| 3 | [4,5'-Bipyrimidine]-2,2'-diamine, 4',6-dimethoxy-N,N,N',N'-tetramethyl- | Not found |
| 4 | 12-Hydroxystearic acid, phenacyl ester | Increase Aromatic Amino Acid Decarboxylase Activity |
| 5 | Azadirachtin, de[(E)-2-methyl-1-oxo-2-butenyl](1,2-dioxopropyl)dihydro- | Not found |
| 6 | Tricyclo[3.3.1.1(3,7)]decane, 1,2,2,3,4,4,6,6,8,8,9,9,10,10-tetradecafluoro-5,7-bis(trifluoromethyl)- | Not found |
| 7 | Spiro[cyclohexane-1,3'-[3H]indole]-2'-carboxy-o-toluidide, 7'-methyl- | Not found |
| 8 | 1,3,5-Triazine-2,4,6-triamine, N',N''-bis(3-aminophenyl)-N,N-diphenyl- | Not found |
| 9 | 4''-Dehydroxy-2'',3',3'',4',5,6'',7-hepta-O-methylisoorientin | Anticancer (Oral), Antitumor (Ovary) |
| 10 | 9,10-anthracenedione, 1,4-bis[(2-ethyl-6-methylphenyl)amino]- | Not found |
| 11 | l-Valine, n-heptafluorobutyryl-, heptadecyl ester | Increase natural killer cell activity, Inhibit Production of Tumor Necrosis Factor |

Cyclopropanecarboxylic acid, 1-(phenylmethyl)-, 2, 6-bis(1,1-dimethylethyl)-4-methylphenyl ester has been reported as arachidonic acid-Inhibitor [12]. Arachidonic acid and its metabolites have recently generated a heightened interest due to growing evidence of their significant role in cancer biology. Thus, inhibitors of arachidonic acid have originally been of interest in the treatment of inflammatory conditions and certain types of cardiovascular disease, are now attracting attention as an arsenal against cancer [13]. The compound, cyclopropanecarboxylic acid, 1-(phenylmethyl)-, 2, 6-bis (1,1-dimethylethyl)-4-methylphenyl ester has been demonstrated as catechol-O-methyl-transferase inhibitor [12]. Catechol-O-methyltransferase inhibitors are a class of medications that

are used along with carbidopa-levodopa therapy in the treatment of symptoms of Parkinson's disease. Catechol-O-methyltransferase inhibitors can extend the effectiveness of carbidopa-levodopa therapy, and allow for lower doses of carbidopa-levodopa [14]. Natural killer (NK) cells are innate immune cells equipped with the ability to rapidly kill stressed cells that are neoplastic or virally infected. NK cells are innate immune cells equipped with the ability to rapidly kill stressed cells that are neoplastic or virally infected. Natural killer (NK) cells were first described in the 1970s as large granular lymphocytes with the ability to spontaneously kill tumor cell lines [15]. l-Valine, n-heptafluorobutyryl-, heptadecyl ester have been reported to increase natural killer cell activity [12]. l-Valine, n-heptafluorobutyryl-, heptadecyl ester have been reported to Inhibit Production of Tumor Necrosis Factor. A TNF inhibitor is a pharmaceutical drug that suppresses the physiologic response to tumor necrosis factor (TNF), which is part of the inflammatory response. TNF is involved in autoimmune and immune-mediated disorders such as rheumatoid arthritis, ankylosing spondylitis, inflammatory bowel disease, psoriasis, hidradenitis suppurativa and refractory asthma, so TNF inhibitors may be used in their treatment.

**Conclusion**

The results of the study clearly suggested the presence of bioactive compounds in the ethanol extracts of *Panicum maximum* leaves. The bioactive compounds support the use of *Panicum maximum* leaves in the treatment of diseases like cancer, diabetes and hypertension.

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