GC-MS ANALYSIS OF BIOACTIVE COMPOUNDS IN SUGARCANE ROOT EXTRACT (SACCHARUM OFFICINARUM)

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Abstract

Plants are known to contain phytochemicals of pharmacological relevance and as such have been utilised in the treatment and management of various diseases. Sugarcane root (saccharum officinarum) has been reportedly used in the traditional treatment and management of diseases. This study is aimed at identifying compounds with pharmacological relevance. The GC-MS analysis of sugarcane crude extract revealed the presence of 51 bioactive compounds as depicted by 51 respective peaks for each compound in GC-MS chromatogram. The identification of bioactive chemical compounds is based on the peak area, retention time molecular weight and molecular formula. To mention but a few major compounds identified were Cycloeicosane and 2, 4-Di-tert-butylphenol with retention time 31.72 and 20.85 min respectively. Minor compounds such as Preng-16-ene-11 and Hexadecane (1.24%) with retention time 22.67 and 14.92 min respectively were identified. Conclusively, sugarcane root extract (Saccharum officinarum) bioactive compound screening shows applauding evidence and can be considered a good source for natural therapeutic products. Furthermore, it can be concluded about this plant that asides being sugar (carbon) source the cane root also exhibits several biological and pharmaceutical properties which provide an insight to the medical value of sugarcane plant which can be further evaluated to optimize how the plant may be utilized to explore its medicinal potential.

Keywords: sugarcane, bioactive, chromatogram, extract and compounds.

Introduction

Plants have formed the basis for sophisticated systems of traditional medicines (Ghulam Mustafal, Rawaba, Asia, Sumaira and Amer, 2017). Natural bioactive compounds (NBCs) are receiving more popularity because of their various medicinal properties and huge exploitation in various commercial sectors such as food, chemical, and pharmaceutical industries (nishi et al., 2021). Various bioactive compounds extracted from different regions of plants have been identified for the treatment of human pathologies (Henryet al, 2021).

Secondary metabolites have shown to possess various biological effects, which provide the scientific base for the use of herbs in the traditional medicine in many ancient communities (Rehab and Amira, 2018).Plants are used as medicines in various cultures and serve as a source of many potent drugs due to the presence of certain bioactive compounds for pharmaceutical industries (Njoku, Umeh &Ogugofor 2021). A good knowledge of the chemical composition of plants leads to a better understanding of its possible medicinal value (Rehab and Amira, 2018).According to the World Health Organization (WHO), more than 80% of the world's population relies on traditional medicine for their primary healthcare needs (Tilburt & kaptchuk 2008). Natural products, such as plant extract, either as pure compounds or as standardized extracts, provide unlimited opportunities for new drug discoveries because of the unmatched availability of chemical diversity (Cos et al; 2006). There has been no research on the bioactive components of sugar cane root extract, though several types of research had been made on other parts of the plants, therefore there is a need to screen Sugarcane (*Saccharum officinarum*) root extracts for bioactive components and to check the presence, functions and characterized the bioactive components. As a result of increasing demand for chemical diversity in screening programs, seeking therapeutic drugs from a natural product, interest, particularly in edible plants, has grown throughout the world. The study focuses or intends to quantitatively evaluate the plant chemical composition of the sugarcane root extract and also to validate this hypothesized claim, it is important to carry out a phytochemical screening and also to characterize the bioactive compounds.

Figure 1: The sugarcane root (Saccharum officinarum) (www.henantmore.org.in retrieved on

(12/02/2021).

Materials and Methods

Chemicals

All the chemicals and reagents used for the research were of analytical grade.

Plant root collection and identification

Sugarcane (*Saccharum officinarum*) roots were collected from Papalanto, Ogun State. The taxonomy identification was carried out at forest herbarium Ibadan (FHI), the identification number was given as 112981.

Preparation of plant material

The sugarcane root was dried at room temperature after which it was ground into fine particles and 1500 g was macerated in 50% ethanol and allowed to stand for 48 h at room temperature. The mixture was filtered with Whatman No. 1 filter paper and the filtrate was concentrated using a rotary evaporator to get a brownish black semi-solid extract. The extracts were then stored in a cold room for further use.

Gas chromatography-mass spectrometry (GC-MS) analysis

The residue was dissolved in 1 ml methanol, filtered through a 0.2 µm syringe filter, and stored at 4°C for 24 h before being used for GC-MS. Identification of components was achieved based on their retention indices and interpretation of mass spectrum was conducted using the database of National Institute of Standards and Technology (NSIT). The database consists of more than 62,000 patterns of known compounds. The spectra of the unknown components of *Saccharum officinarum* fraction obtained were compared with the standard mass spectra of known components stored in NIST library (NISTII

Results and Discussion

Results

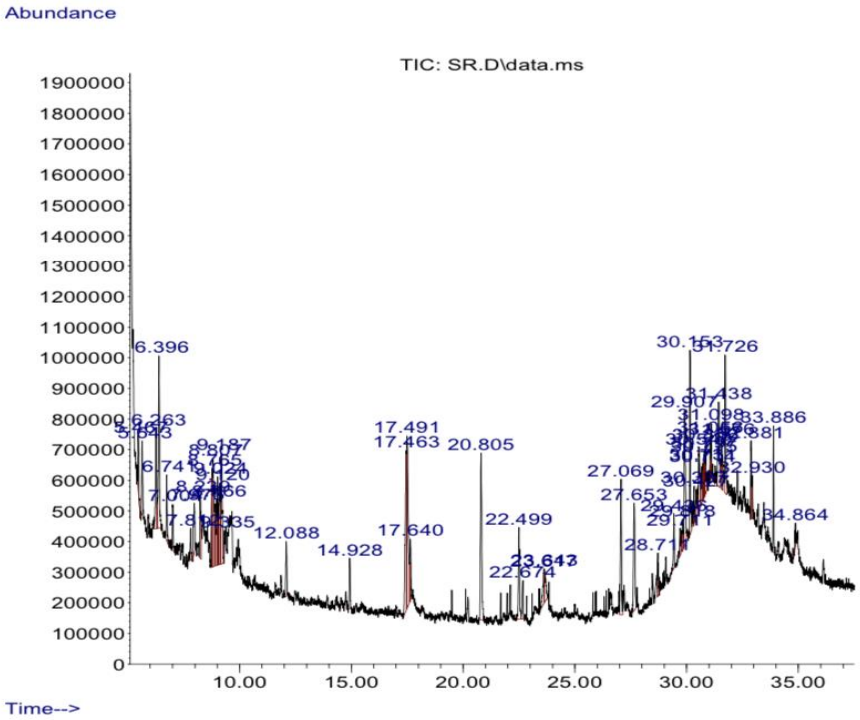


Figure 2.0: Gcms Analysis of Sugarcane Root (Saccharum Officinarum) Crude Extract

Table 1.0:Gc-Ms Revealed Bioactive Compounds in Sugarcane Root Extract (Saccharum Officinarum)

GC-MS analysis revealed a total of 51 bioactive compounds in the crude extract of sugarcane root (saccharum officinarum).

PEAK	RETENTION TIME	COMPOUND DERIVED
1	5.4	1 nitro beta-d-arabinofuranose acetate
2	5.6	benzene 1,2,4 trimethyl
3	6.2	benezene1-ethyl ,3methyl
4	6.3	decanoic acid, hexyl ester
5	6.7	benzene,1,4-dichloro
6	7	cyclopropa-3,4-benz 1,2,4,5-azauleno
7	7.8	3,4-carboxylmethyl-methyl-carbamony
8	7.9	Hexadecane 2,5 dimethyl
9	8.2	hydroxylamine, O-2-methylpropyl
10	8.7	Nonane
11	8.8	dimethylmalonic acid
12	8.9	undecane,2,6-dimethyl
13	9	nonadecane,2-methyl
14	9.1	octane,3,5-dimethyl
15	9.1	iodo-2-methylnonane
16	9.3	3, beta-hydroxy-6-aza-B-homo-5.alpha
17	12	Decane
18	14.9	Hexadecane,2,6,10,14 tetramethyl
19	17.4	formic acid hydrazide
20	17.4	silver butanoate
21	17.6	Isoamyl nitrate
22	20.8	2,4-di-tert-butylphenol
23	22.4	8-heptadecene
24	22.6	pregn-16-ene-11,14,18,20-tetrol
25	23.6	ethyl.alpha-d-glucopyranoside
26	23.6	beta-methyl xyloside
27	27	2-trifluroacetatoxytridecane

28	27	4-methoxy-7-methylindan-1-one
29	28.7	di-mevalonic acid lactone
30	29.4	oxirane undecanoic acid,3-pentylmethyl
31	29.7	cyclopentane undecanoic acid
32	29.8	12-methyl-E-E-2,13-octadecadien-1-ol
33	29.9	1,2-benzene dicarboxylic acid
34	30.3	1-Eicosene
35	30.3	cyclopentaneundecanoic acid
36	30.4	under-10-ynoic acid
37	30.5	10,12-Hexadecadien-1-ol acetate
38	30.7	9,12-octadecadienoyl chloride
39	30.7	9-oxabicyclo,6.1.0 nonane
	30.7	cyclopentane undecanoic acid
41	30.7	10,12, hexadecadien-1-ol acetate
42	30.8	9-oxabicyclo6.1.0, nonane
43	31	1,9-hexadecadiene
44	31	9,12-octadecadienal
45	31.4	1,9-hexadecadiene
46	31.5	9,12-octadecadienal
47	31.7	Cycloeicosane
48	32.8	2-piperidinone
49	32.9	9-hexadecenoic acid
50	33.8	Diisooctyl phthalate
51	34.8	2-methyloctadeca-7,8-diol

Discussion

The results of this study work show that sugarcane root saccharum officinarum is a good source for therapeutic bioactive compounds. Among the identified bioactive components 1 nitro beta-d-arabinofuranose acetate has the highest peak. Sabreen et al, (2015) also reported 1 nitro beta-d-arabinofuranose acetate as one of the 26 bioactive compounds found in Alternaria alternata and it was identified as an antibacterial compound. Eman et al, (2020) also reported it as an antimicrobial compound. Benezene1-ethyl ,3methyl has been reported as a major component of an essential oil by Daniel, 2017. n-Hexadecanoic acid has antioxidant, 5- alpha-reductase inhibitor, anti-fibrinolytic, hemolytic, antimicrobial activity, hypocholesterolemic nematicide, pesticide, antiandrogenic flavor, and hemolytic properties (Njoku et al., 2021). 9,12- Octadecadienoic acid, methyl ester has anti-inflammatory, anti-arthritic, hepatoprotective, antiandrogenic, hypocholesterolemic, nematicide, 5-alpha-reductase inhibitor, antihistaminic, anticoronary, insectifuge, antieczemic, and antiacne properties cyclo (Njoku et al., 2021). 9-Hexadecenoic acid has been reported to have an antimicrobial biological activity (Shettima, Karumi, Sodipo, Usman and Tijjani, 2013).

Hexadecane has been reported to show antibacterial and antioxidant activities (Gopal and Anand, 2017). Tetradecane antimicrobial activity, wound healing activity, anti-viraland, antitumor activities (Gopal and Anand, 2017).

Among the bioactive compounds identified in the GC-MS analysis of Sugarcane root extract; some have been reported to show anti-microbialactivity, Anti-inflammatory, Anti-cancer and anti-oxidant and also showed activities. 9, 12-octadecanoic has been reported to be a stearic acid and also been used as a dietary supplement (Renji and Gaprasad, 2018). β-Methyl-xyloside (β-mx) is a structural analog of xylobiose. β-mx has been reported to have the ability to increase extracellular enzyme production e.g xylanase (Marìa , Amelia, Marìa, 2005) These bioactive phytoconstituents could be responsible for the therapeutic ability of various extracts of sugarcane root as it has claimed in ethnomedicine. The analgesic activity of hydrazide and hydrazine derivatives a new series of these compounds were synthesized in order to obtain new analgesic compounds (Mansur et al., 2013). Hydrazide–hydrazone derivatives are present in many bioactive molecules and display a wide variety of biological activities, such as antibacterial, antitubercular, antifungal, anticancer, anti-inflammatory, anticonvulsant, antiviral, and antiprotozoal action (Łukasz Popiołek, 2017). Thus, the identification of a various bioactive compounds from sugarcane root extracts displays significant medicinal properties of the plant. Further studies like bio-prospecting are essential to support its biological properties and biological importance of these innovative bio-molecules will be interesting to be studied. To the best of our knowledge, this is the first report on GC and MS investigation of sugarcane root saccharum officinarum.

Conclusion and Recommendation

In conclusion, sugarcane root extract (saccharum officinarum) bioactive compound screening shows applauding evidence and can be considered a good source for natural therapeutic products. Furthermore, it can be concluded about this plant that asides being sugar (carbon) source the cane root also exhibits several biological and pharmaceutical properties which provide an insight to the medical value of sugarcane plant which can be further evaluated to optimize how the plant may be utilized to explore its medicinal potential. More comprehensive studies related to the compounds found in this work will enhance pharmaceutical exploration in disease control and management.

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