IJPSR (2022), Volume 13, Issue 6 **(Research Article)**

INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES AND RESEARCH

Received on 10 September 2021; received in revised form, 06 November 2021; accepted, 17 November 2021; published 01 June 2022

GC-MS ANALYSIS OF METHANOLIC EXTRACT OF *UROCHLOA DISTACHYA* (L.) T. Q. NGUYEN, LEAVE

Smrutiranjan Dash [* 1], Ashutosh Meher [1], Srimanta Kumar Dash [1], Chandan Das [2] and Santosh Kumar Dash [1]

Department of Pharmacology [1], The Pharmaceutical College, Samaleswari Vihar, Tingipali, Barpali, Bargarh - 768029, Odisha, India.
School of Pharmacy and Life Science [2], Centurion University of Technology and Management, Bhubaneswar - 751009, Odisha, India.

Keywords:

Urochloa distachya, methanolic, GC-MS analysis

Correspondence to Author:
Mr. Smrutiranjan Dash

Assistant Professor,
Department of Pharmacology,
Pharmaceutical College, Samaleswari Vihar, Tingipali, Barpali, Bargarh - 768029, Odisha, India.

E-mail: dash.smruti1992@gmail.com

ABSTRACT: *Urochloa distachya* (Poaceae), commonly known as Signal grass 20-60 cm long found in tropical Asian origin, Africa, and other countries. Generally, it has been used in fodder, animal feed etc., and least and no therapeutic activities were reported. The present study was established to identify the phytochemicals by using GC-MS of the *U. distachya* leaves part. The leaves part of the plant was extracted in methanol by using the Soxhlet apparatus. The GC-MS Methanolic extract of *U. distachya* identified 26 phytocomponents; Z-7-Pentadecenol; t-Butyl hydrogen phthalate, Ricinoleic acid; Methyl -12-hydroxy-9-octadecenoate; Octadecanoic acid; Glycerin; 4, 6-Diphenyl-2-(2-hydroxyphenyl) pyrimidine, Eicosanoid acid, methyl ester, 2-Naphthalenol 2, 3, 4, 4a, 5, 6, 7-octahydro1, 4adimethyl-7-(2-hydroxy-1-methylethyl); Cholest-5-en-3-ol (3á), tetradecanoate; 6-Octadecenoic Acid; Oleic acid, 3-hydroxypropyl ester; Octadecanoic acid, 2, 3-dihydroxypropyl ester; Eicosane; Tert-Hexadecanethiol; 2-[4-methyl-6-(2, 6, 6-trimethylcyclohex-1-enyl) hexa-1, 3, 5-trienyl] cyclohex1en-1-carboxaldehyde; Spiro [4.5] decan-7-one, 1, 8-dimethyl-8, 9-epoxy-4-isopropyl; 9, 12, 15-Octadecatrienoic acid, 2, 3-bis [(trimethylsilyl) oxy] propyl ester, (Z, Z, Z). The phytoconstituents of methanolic extract of *U. distachya* has shown remarkable activities like antimicrobial, antioxidant, anti-inflammatory and anticancer *etc.*

INTRODUCTION: Medicinal plants are of great importance in the field of treatment and cure of diseases. The medicinal value of plants depends on the presence of certain chemical substances, so scientific research defines the chemical effects and composition of active ingredients, which determine the medicinal properties of plants.

QUICK RESPONSE CODE

DOI: 10.13040/IJPSR.0975-8232.13(1).2380-94

This article can be accessed online on www.ijpsr.com

DOI link: http://dx.doi.org/10.13040/IJPSR.0975-8232.13(1).2380-94

HPLC, HPTLC and GC-MS are a modern analytical technique that provides superior separation of plant extract sample. High-performance liquid chromatography (HPLC) is a separation technique used to identify, purify, and quantify the individual components of the mixture sample [1].

High-performance thin-layer chromatography (HPTLC) is very useful for qualitative as well as quantitative analytical works. This technique plays a vital role in phytochemical analysis, biochemical analysis, fingerprint analysis, herbal drugs quantification, *etc.* [2].

Gas chromatography-mass spectroscopy is a combined analytical technique used to detect and identify the chemical component present in the plant extract. The GC-MS studies are essential for the determination of biologically active components from the plant sample. *Urochloa distachya (L.)* T. Q. Nguyen (Poaceae) is generally known as signal grass. It is an annual grass, with 20-60 cm high, lance-shaped leaves, 2-3 racemes, bearing spikelet, found in tropical Asian origin, Africa, and other countries. This plant is adapted to the warm tropics, particularly in monsoon environments. This species flowers throughout the year. It reproduces vegetative, developing roots from nodes in culms in contact with soil. Stolons develop into new culms and form clones. At 26°C of soil temperature gets geminate. The plant has been used in fodder, animal feed, *etc*. there is less or no biological activities are reported [3]. Literature review revealed that there was no HPLC, HPTLC, and GC-MS was not carried out for the standardization of *Urochloa distachya*. Therefore, the present investigation was focused on analyzing the qualitative estimation of phytoconstituents present in the plant by GCMS analysis.

MATERIAL AND METHOD:

Collection and Preparation of Plant Materials: The fresh plant was collected from Hatgaon, Rusuda, Bargarh, Odisha, India and authenticated by a Botanical survey of India, Kolkata, India, bearing reference number: CNH/Tech.II/2019/77. The leaves parts of the plant were dried under shade. The dried leaves were ground into powder by using mechanical grinder. The powder material was stored in an airtight container for further use.

Preparation of Extract: The dried leave powder weighing about 200 gm was mounted in the Soxhlet apparatus and extracted with methanol (60-65°C). The extract was concentrated with the help of a rotary evaporator and stored in the desiccator at a temperature 4°C for further use.

GC-MS: The methanolic extract of *U. distachya* was subjected to Thermo Scientific TSQ 8000 Gas Chromatograph - Mass Spectrometer. MS part consists of Triple Quadrupole, and the GC part consists of Split/Split less Injectors and multi-mode (including on-column) Programmed Temperature Vaporizing (PTV), the column temperature is 400 °C. The mass spectrometer joined with the TRACE 1300 GC along with Auto-sampler for automated sample handling. About 1 µl of the methanol extract was injected into the GC-MS using a microsyringe and the scanning was done for 31.08 minutes. The carrier gas was used as Helium gas at a constant flow rate of 1 ml/minute.

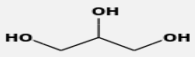
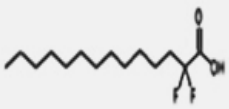
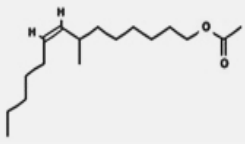
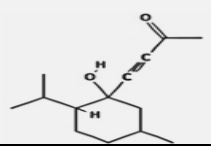
The ion source was programmed to 350°C. The name, molecular formula, and molecular weight of the components were referred from the National Institute of Standard and Technology (NIST).

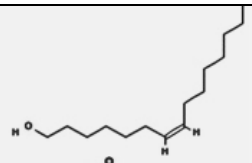
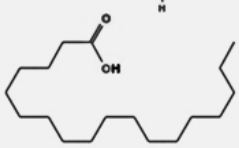
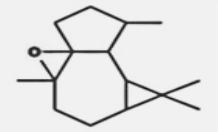
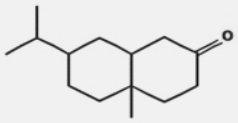
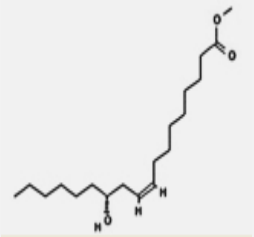
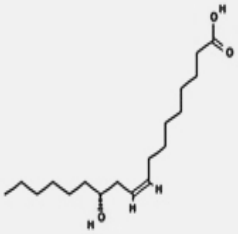
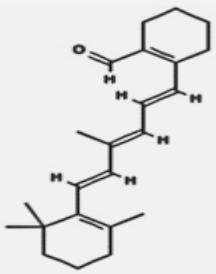
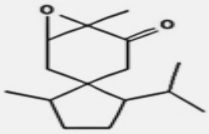
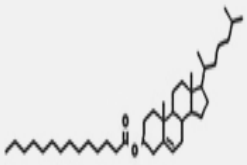
RESULTS AND DISCUSSION: Gas chromatography and mass spectroscopy are very efficient and effective methods for separating and detecting a mixture of phytochemicals. The GCMS analysis of a methanolic extract of *U. distachya* was depicted in **Fig. 1**. The retention time (RT), structure, molecular formula, and percentage peak areas of the identified compounds are given in **Table 1**. The methanolic extract of *U. distachya* showed the presence of 26 compounds.

Out of these compound four compounds were determined as major compound Z-7-Pentadecenol (31.37%) **Fig. 7**, t-Butyl hydrogen phthalate (13.90%) **Fig. 20**, Ricinoleic acid (11.88%) **Fig. 12**, Methyl -12-hydroxy-9-octadecenoate (9.72%) **Fig. 11** and rest compound were minor compound Octadecanoic acid (3.16%) **Fig. 8**, Glycerin (2.69%) **Fig. 1**, 4,6-Diphenyl-2-(2-hydroxyphenyl) pyrimidine (2.82%) **Fig. 23**, Eicosanoid acid, methyl ester (2.62%) **Fig. 13**, 2-Naphthalenol, 2, 3, 4, 4a, 5, 6, 7 -octahydro1, 4adimethyl-7-(2-hydroxy-1-methylethyl) (2.34%) **Fig. 10**, Cholest-5-en-3-ol (3á), tetradecanoate (2.26%) **Fig. 16**, 6-Octadecenoic Acid (2.10%) **Fig. 25**, Oleic acid, 3-hydroxypropyl ester (1.92%) **Fig. 24**, Octadecanoic acid, 2, 3-dihydroxypropyl ester (1.92%) **Fig. 26**, Eicosane (1.59%) **Fig. 21**, Tert-Hexadecanethiol (1.34%) **Fig. 18**, 2 - [4 – methyl – 6 - (2, 6, 6-trimethylcyclohex – 1 - enyl) hexa-1, 3, 5-trienyl] cyclohex1en-1-carboxaldehyde (1.21%) **Fig. 14**, Spiro [4.5] decan-7-one, 1, 8-dimethyl-8,9-epoxy-4-isopropyl (0.98%) **Fig. 15**, 9, 12, 15-Octadecatrienoic acid, 2, 3-bis [(trimethylsilyl) oxy] propyl ester, (Z, Z, Z) (0.98%) **Fig. 22**, 2, 3-Dihydroxypropyl elaidate (0.79%) **Fig. 4**, Hexadecanoic acid, 2-hydroxy-1-(hydroxymethyl) ethyl ester (0.79%) **Fig. 19**, Oleic acid, 3-

(octadecyloxy) propyl ester (0.72%) Figure 17], Diisooctyl phthalate (0.69%) **Fig. 27**, 2,2-Difluoroheptacosanoic acid (0.65%) **Fig. 3**, Ledene oxide (II) (0.58%) **Fig. 9**, Menthol, 1'-(butyn-3-one-1-yl), (1R,2S,5R) (0.52%) **Fig. 6**, 7-methyl-z-tetradecen-1-ol acetate (0.49%) **Fig. 5.** The GC-MS investigation compounds of the methanolic extract of *U. distachya (L.)* showed various biological activities, which were presented in **Table 2**. 2, 3-Dihydroxypropyl elaidate, 9, 12, 15 – Octadecatrienoic acid, 2, 3 – bis [(trimethylsilyl) oxy] propyl ester, (Z, Z, Z), and Oleic acid, 3 – hydroxypropyl ester are fatty acid in nature, and they showed antioxidant activity [6, 22, 23]. 2, 2-Difluoroheptacosanoic acid is an acid compound stated to possess antimicrobial activity [5]. 2, 3-Dihydroxypropyl elaidate, 7-Methyl-Z-tetradecen-1-ol acetate, Menthol, 1'-(butyn-3-one-1-yl), (1S, 2S, 5R) and 6-Octadecenoic acid are fatty acid, acetate compound, monoterpene and fatty acid in nature respectively which showed anti-cancer activity [6, 7, 10, 24]. Apart from anti-cancer activity of 7-Methyl-Z-tetradecen-1-ol acetate also indicate anti-inflammatory and hepatoprotective activities [7]. 9, 12, 15-Octadecatrienoic acid, 2, 3-dihydroxypropyl ester, (Z, Z, Z) is Linolenic acid ester compound that exhibits antioxidant, antimicrobial activity, anti-inflammatory, nematicide, antihistaminic antieczemic, insectifuge [8], hypo-cholesterolemia nematicide antiarthritic activities [9]. Antimicrobial, dietary supplements, softening agents, and surfactant activities showed by Octadecanoic acid, which is a fatty acid in nature[11]. Ledene oxide (II) is sesquiterpenoid in nature, and the activities are indicated antibacterial, antioxidant [12]. 2- [4-methyl-6-(2, 6, 6-trimethylcyclohex-1-enyl) hexa 1, 3, 5-trienyl] cyclohex-1-en-1-carboxaldehyde is an aldehyde compound that showed antimicrobial and anti-inflammatory activity [16]. Oleic acid, 3-(octadecyloxy) propyl ester revealed antifungal activity, a fatty acid in nature [18]. Eicosane produced antifungal, antibacterial, antitumor, and cytotoxic activity [21]. Diisooctyl phthalate revealed antimicrobial and antifouling activity [21]. The CG-MS of *U. distachya* proposed that the biological properties of several components possess antioxidant, anti-inflammatory, antimicrobial, and anticancer activities, so further investigation and isolation of the plant can reveal newer molecules that will be helpful for the study of therapeutic and pharmacological activities.

TABLE 1: GC-MS ANALYSIS OF METHANOLIC EXTRACT OF *U. DISTACHYA*

Sl. no.	RT	Name of the compound	Chemical structure	Molecular formula	Molecular weight	Peak area %
1	10.52	Glycerin		$C_3H_8O_3$	92.0938	2.69
2	17.28	2,2-Difluoroheptacosanoic acid		$C_{14}H_{26}F_2O_2$	264.35	0.65
3	17.90	2,3-Dihydroxypropyl elaidate		$C_{21}H_{40}O_4$	356.5	0.79
4	18.09	7-methyl-z-tetradecen-1-ol acetate		$C_{17}H_{32}O_2$	268.4	0.49
5	19.48	Menthol, 1'-(butyn-3-one-1-yl), (1R,2S,5R)		$C_{14}H_{22}O_2$	222.32	0.52

6	19.94	Z-7-Pentadecenol		$C_{15}H_{30}O$	226.4	31.37
7	20.34	Octadecanoic acid		$C_{18}H_{36}O_2$	284.4772	3.14
8	20.78	Ledene oxide(II)		$C_{15}H_{24}O$	220.3505	0.58
9	21.56	2-Naphthalenol, 2,3,4,4a,5,6,7-octahydro1,4adimethyl-7-(2-hydroxy-1-methylethyl)		$C_{15}H_{26}O_2$	238.37	2.34
10	22.26	Methyl -12-hydroxy-9-octadecenoate		$C_{19}H_{36}O_3$	312.5	9.72
11	22.38	Ricinoleic acid		$C_{18}H_{34}O_3$	298.5	11.88
12	22.97	Eicosanoic acid, methyl ester		$C_{21}H_{42}O_2$	326.5570	2.62
13	23.41	2-[4-methyl-6-(2,6,6-trimethylcyclohex-1-enyl)hexa 1,3,5-trienyl] cyclohex1en-1-carboxaldehyde		$C_{23}H_{32}O$	324.5	1.21
14	24.56	Spiro[4.5]decan-7-one, 1,8-dimethyl-8,9-epoxy-4-isopropyl		$C_{15}H_{24}O_2$	236.35	0.98
15	24.94	Cholest-5-en-3-ol (3á), tetradecanoate		$C_{41}H_{72}O_2$	597	2.26

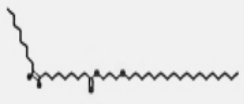
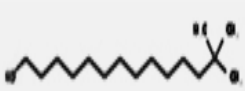
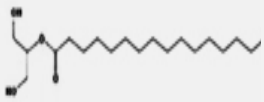
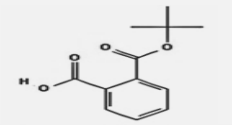
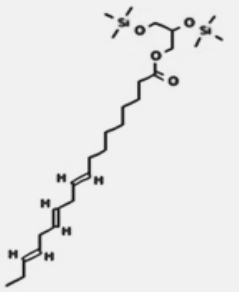
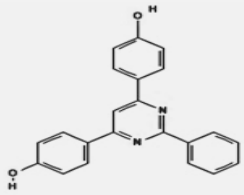
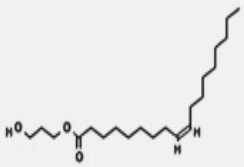
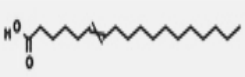
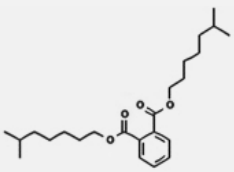
16	25.79	Oleic acid, 3-(octadecyloxy) propyl ester		$C_{39}H_{76}O_3$	593	0.72
17	26.08	Tert-Hexadecanethiol		$C_{16}H_{34}S$	258.511	1.34
18	26.42	Hexadecanoic acid, 2-hydroxy-1-(hydroxymethyl)ethyl ester		$C_{19}H_{38}O_4$	330.5026	0.79
19	26.68	t-Butyl hydrogen phthalate		$C_{12}H_{14}O_4$	222.24	13.90
20	28.34	Eicosane		$C_{20}H_{42}$	282.5	1.59
21	28.88	9,12,15-Octadecatrienoic acid,2,3-bis[(trimethylsilyl)oxy]propyl ester, (Z,Z,Z)		$C_{27}H_{52}O_4Si_2$	496.9	0.98
22	29.51	4,6-Diphenyl-2-(2-hydroxyphenyl) pyrimidine		$C_{22}H_{16}N_2O$	340.4	2.82
23	30.96	Oleic acid, 3-hydroxypropyl ester		$C_{21}H_{40}O_3$	340.5	1.92
24	31.15	6-Octadecenoic acid		$C_{18}H_{34}O_2$	282.5	2.10
25	31.78	Octadecanoic acid, 2,3-dihydroxypropyl ester		$C_{21}H_{42}O_4$	358.5558	1.92
26	32.41	Diisooctyl phthalate		$C_{24}H_{38}O_4$	390.6	0.69

TABLE 2: BIOLOGICAL PROPERTIES OF THE PHYTOCOMPOUNDS

Sl. no.	Name of the compound	Nature of the compound	Biological activity
1	Glycerin	Simple polyol	Potent osmotic dehydrating agent with additional effects on brain metabolism, decreases intracranial pressure (Reye's syndrome, stroke, encephalitis, meningitis, pseudotumor cerebri, central nervous system tumor, and space-occupying lesions), glaucoma [4]
2	2,2-Difluoroheptacosanoic acid	Acid	Antimicrobial activity [5]
3	2,3-Dihydroxypropyl elaidate	Fatty acid	Anticancer and antioxidant activity [6]
4	7-Methyl-Z-tetradecen-1-ol acetate	Acetate compound	Anti-cancer, anti-inflammatory, hepatoprotective [7]
5	9,12,15-Octadecatrienoic acid, 2,3-dihydroxypropyl ester, (Z, Z, Z)	Linolenic acid ester compound	Antioxidant, antimicrobial activity, anti-inflammatory, nematicide, antihistaminic antieczemic, insectifuge [8], hypocholesterolemia nematicide Antiarthritic [9]
6	Menthol, 1'-(butyn-3-one-1-yl), (1S,2S,5R)	monoterpene	Anticancer activity [10]
7	Octadecanoic acid	Fatty acid	Antimicrobial activity, dietary supplements, softening agent, surfactant [11]
8	Ledeneoxide (II)	Sesquiterpenoid	Antibacterial, antioxidant [12]
9	2-Naphthalenol,2,3,4,4a,5,6,7 octahydro1,4adimethyl-7-(2-hydroxy- 1-methylethyl)	-	Anti-inflammatory [13]
10	Ricinoleic acid	Fatty acid	Gaucher disease treatment pulmonary hypertension treatment skin diseases treatment Ophthalmic drug anti-seborrheic [14]
11	Eicosanoic acid, methyl ester	Arachidic acid	Alpha-glucosidase inhibitors activity [15]
12	2-[4-methyl-6-(2,6,6-trimethylcyclohex-1-enyl)hexa-1,3,5-trienyl] cyclohex1en-1-carboxaldehyde	Aldehyde compound	Antimicrobial, anti-inflammatory [16]
13	Spiro[4.5]decan-7-one,1,8-dimethyl-8,9-epoxy-4-isopropyl	-	Anti-inflammatory activity [17]
14	Oleic acid, 3-(octadecyloxy) propyl ester	Fatty acid	Antifungal[18].
15	Tert-Hexadecanethiol	-	Enzyme activators[19].
16	Hexadecanoic acid, 2-hydroxy-1-(hydroxymethyl)ethyl ester	Amino compound	Hemolytic, pesticide, flavor, antioxidant 20
17	Eicosane	Alkane	Antifungal, antibacterial, antitumor, cytotoxic [21]
18	9,12,15-Octadecatrienoic acid,2,3-bis[(trimethylsilyl)oxy]propyl ester, (Z,Z,Z)	Fatty acid	Antioxidant, antidiabetic, anti-inflammatory [22]
19	Oleic acid, 3-hydroxypropyl ester	Fatty acid	Antimicrobial and antioxidant [23]
20	6-Octadecenoic acid	Fatty acid	Anti-cancerous [24]
21	Octadecanoic acid, 2,3-dihydroxy propyl ester	Fatty acid	Food additive in dairy, surfactants, antiviral [25]
22	Diisooctyl phthalate	-	Antimicrobial and antifouling [26]

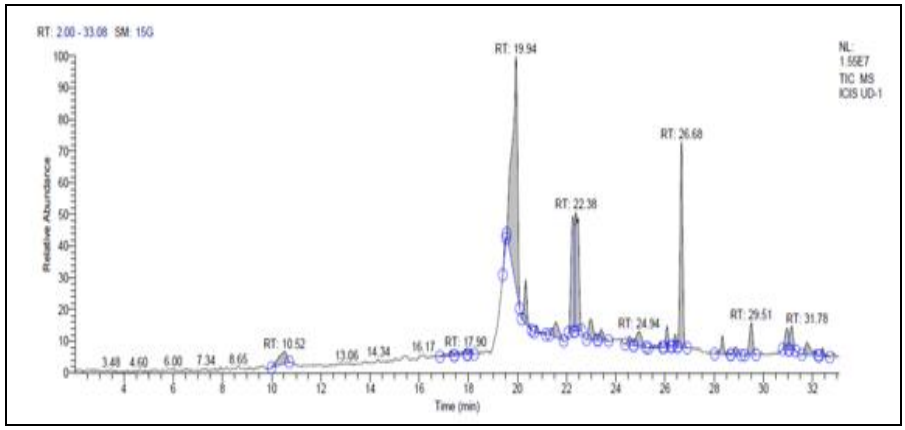


FIG. 1: GC-MS CHROMATOGRAM OF THE METHANOLIC LEAVES EXTRACT OF *U. DISTACHYA*

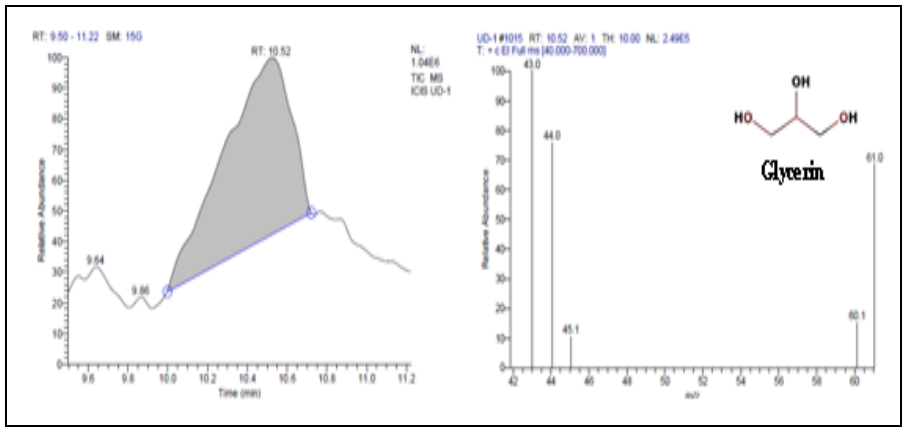


FIG. 2: GC-MS CHROMATOGRAM OF GLYCERIN (10.52)

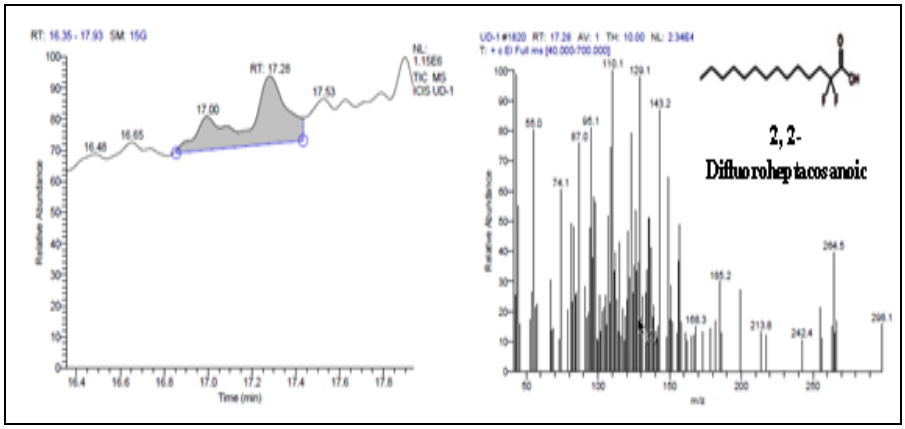


FIG. 3: GC-MS CHROMATOGRAM OF 2, 2-DIFLUOROHEPTACOSANOIC ACID (17.28)

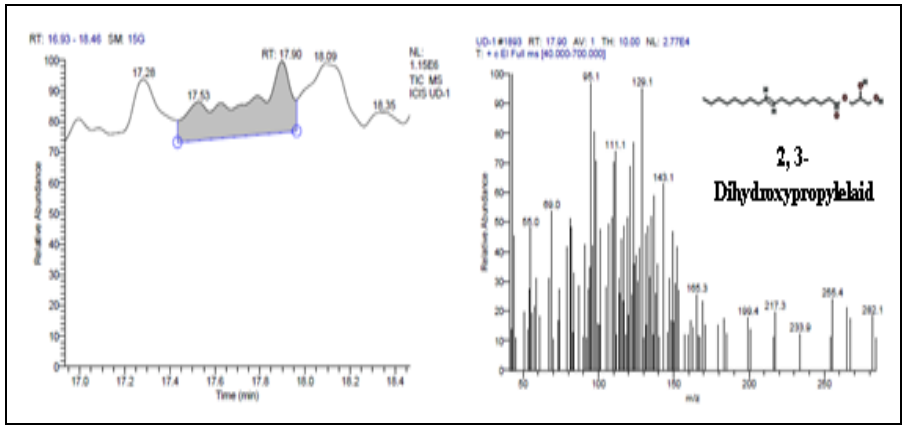


FIG. 4: GC-MS CHROMATOGRAM OF 2, 3-DIHYDROXYPROPYL ELAIDATE (17.90)

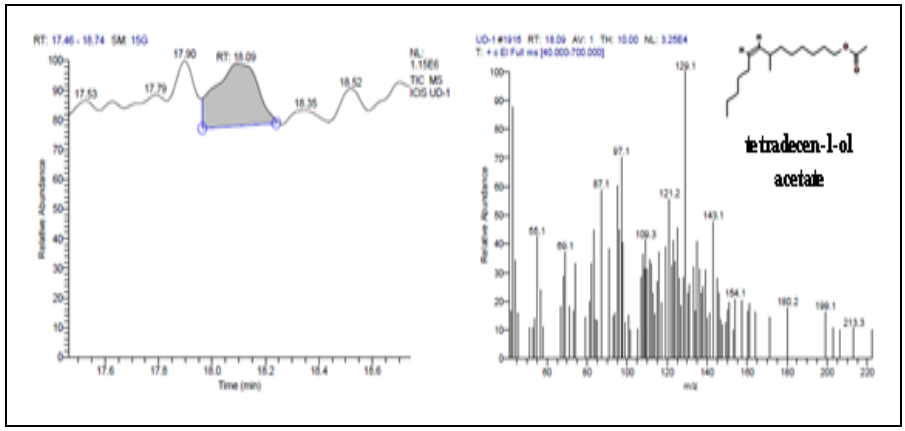


FIG. 5: GC-MS CHROMATOGRAM OF 7-METHYL-Z-TETRADECEN-1-OL ACETATE (18.09)

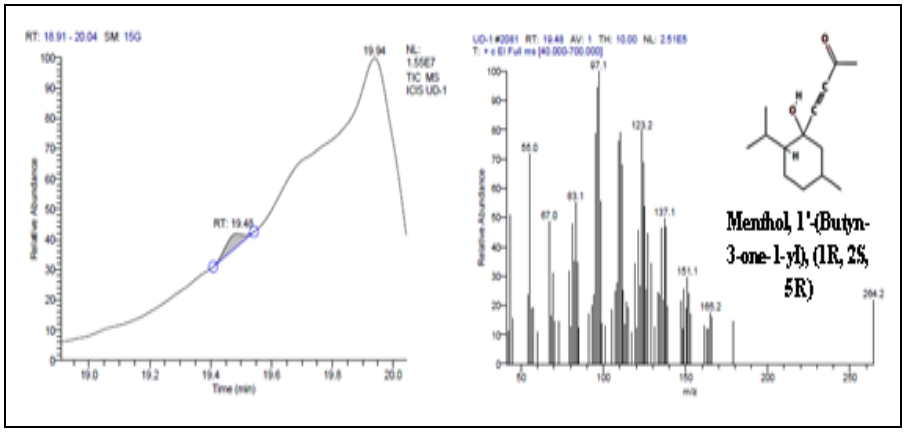


FIG. 6: GC-MS CHROMATOGRAM OF MENTHOL, 1'-(BUTYN-3-ONE-1-YL), (1R, 2S, 5R) (19.48)

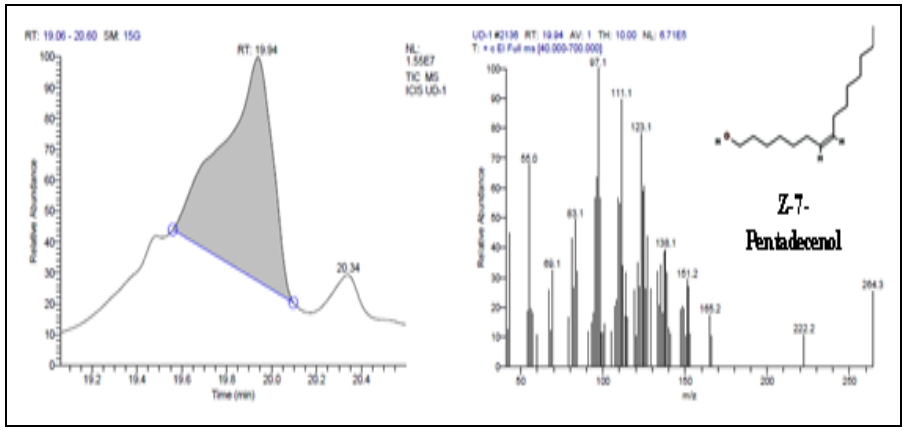


FIG. 7: GC-MS CHROMATOGRAM OF Z-7-PENTADECENOL (19.94)

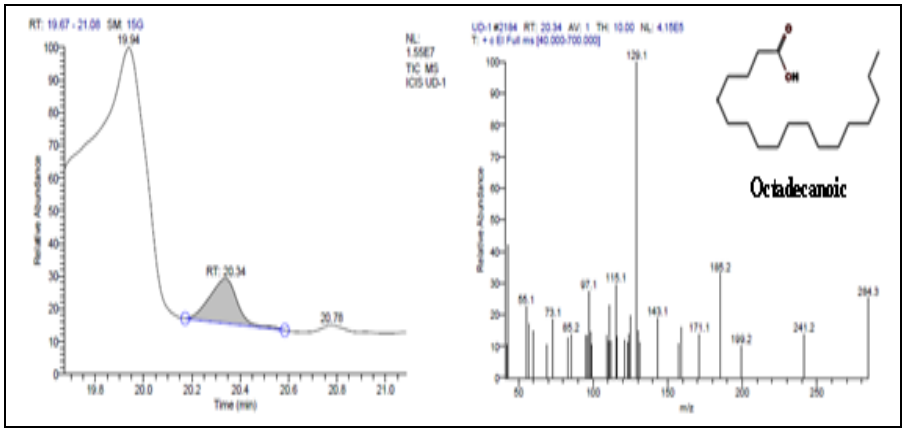


FIG. 8: GC-MS CHROMATOGRAM OF OCTADECANOIC ACID (20.34)

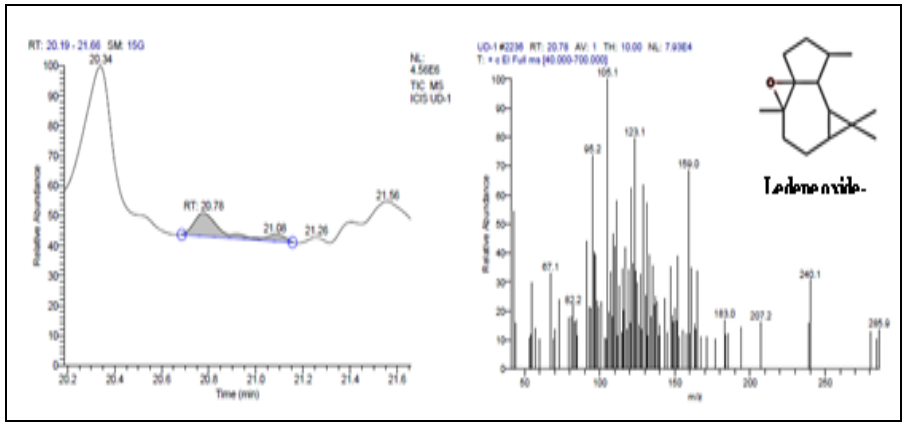


FIG. 9: GC-MS CHROMATOGRAM OF LEDENE OXIDE-(II) (20.78)

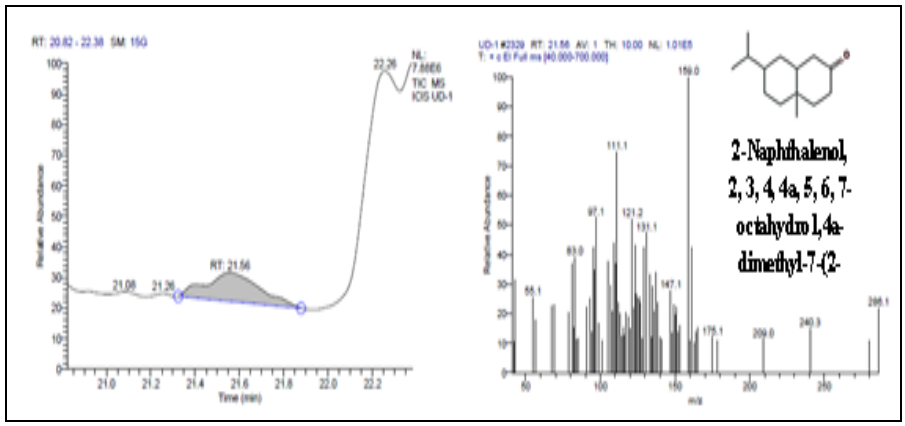


FIG. 10: GC-MS CHROMATOGRAM OF 2-NAPHTHALENOL, 2, 3, 4, 4A, 5, 6, 7-OCTAHYDRO1, 4A-DIMETHYL-7-(2-HYDROXY- 1-METHYL ETHYL) (21.56)

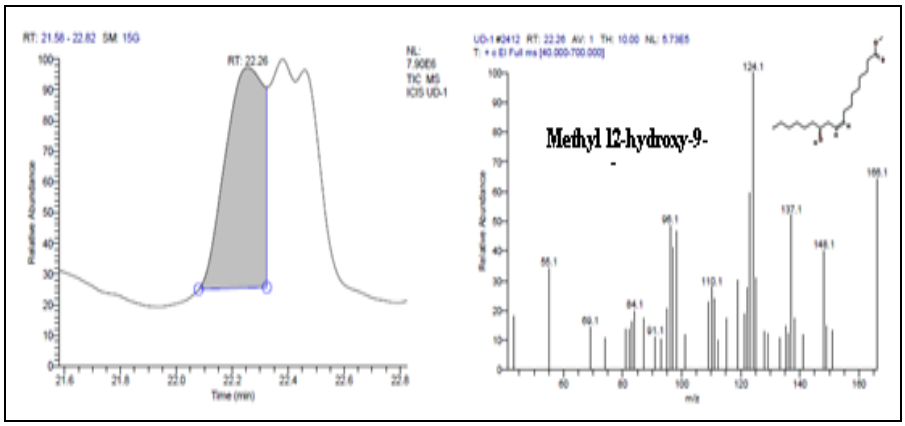


FIG. 11: GC-MS CHROMATOGRAM OF METHYL 12-HYDROXY-9-OCTADECENOATE (22.26)

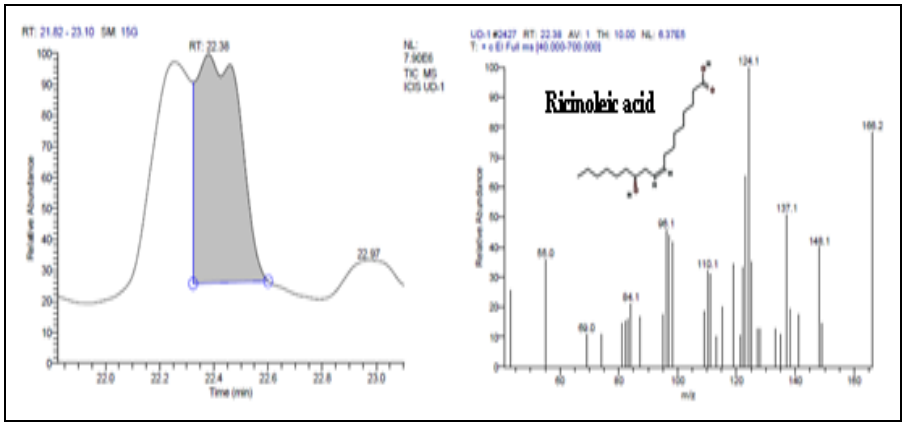


FIG. 12: GC-MS CHROMATOGRAM OF RICINOLEICACID (22.38)

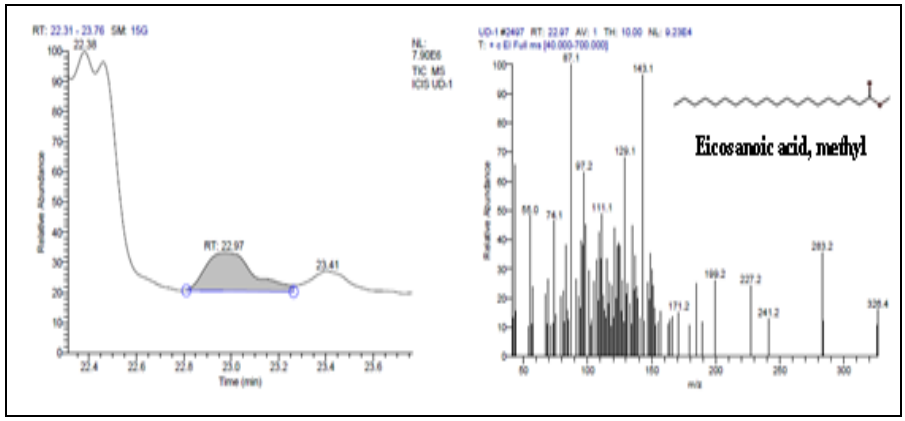


FIG. 13: GC-MS CHROMATOGRAM OF EICOSANOICACID, METHYL ESTER (22.97)

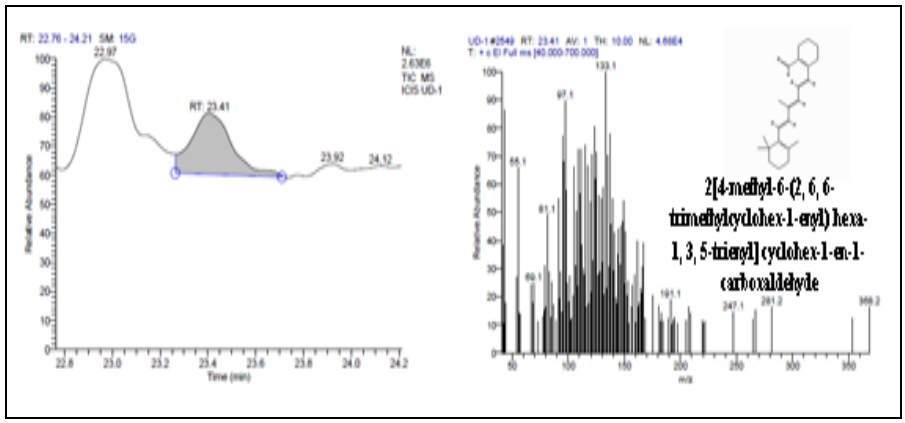


FIG. 14: GC-MS CHROMATOGRAM OF 2[4-METHYL-6-(2, 6, 6-TRIMETHYLCYCLOHEX-1-ENYL) HEXA-1, 3, 5-TRIENYL] CYCLOHEX-1-EN-1-CARBOXALDEHYDE (23.41)

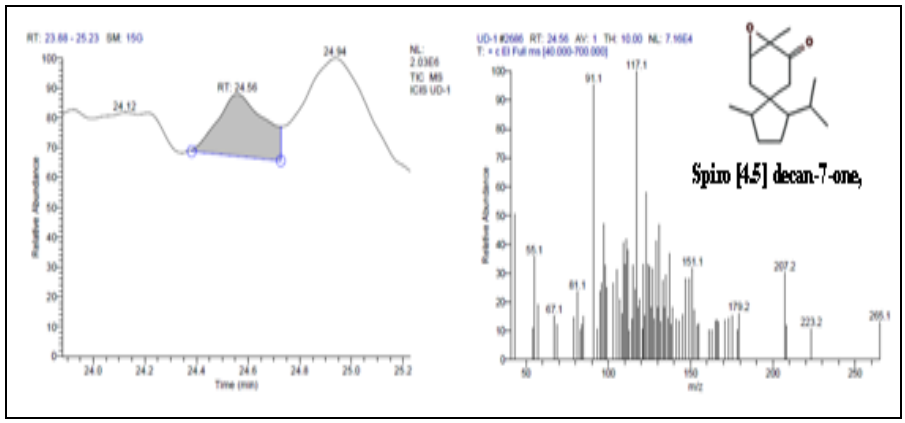


FIG. 15: GC-MS CHROMATOGRAM OF SPIRO [4.5] DECAN-7-ONE, 1,8-DIMETHYL-8,9-EPOXY-4-ISOPROPYL (24.56)

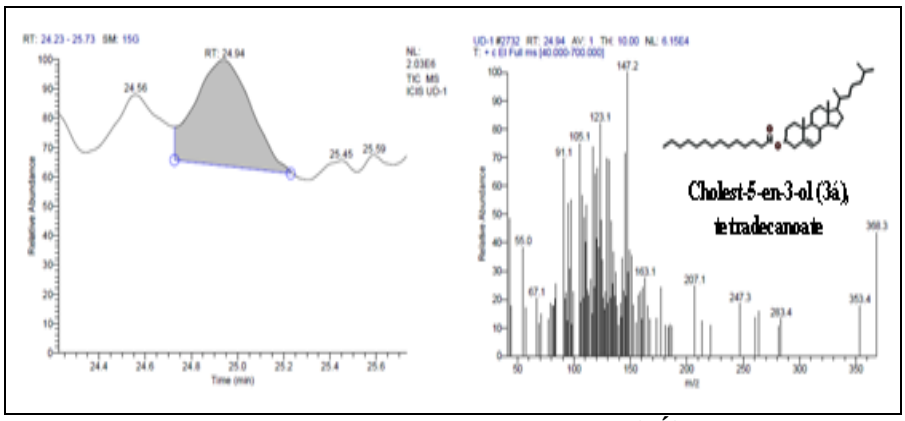


FIG. 16: GC-MS CHROMATOGRAM OF CHOLEST-5-EN-3-OL (3Á), TETRADECANOATE (24.94)

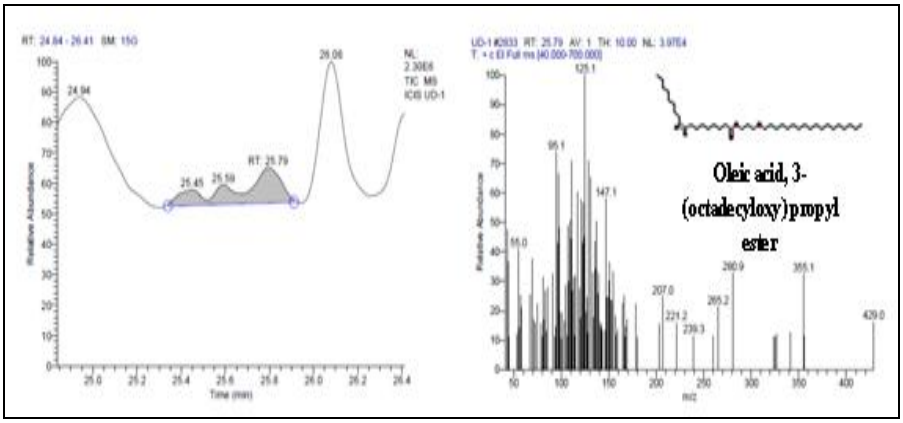


FIG. 17: GC-MS CHROMATOGRAM OF OLEIC ACID, 3-(OCTADECYLOXY) PROPYL ESTER (25.79)

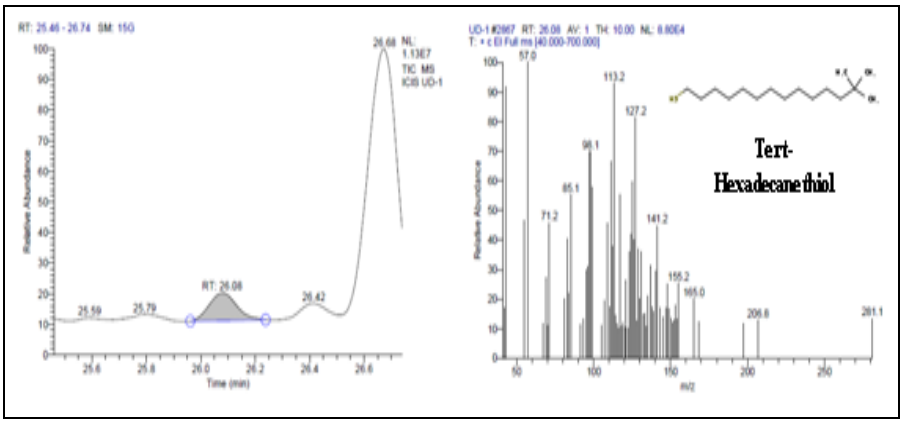


FIG. 18: GC-MS CHROMATOGRAM OF TERT-HEXADECANETHIOL (26.08)

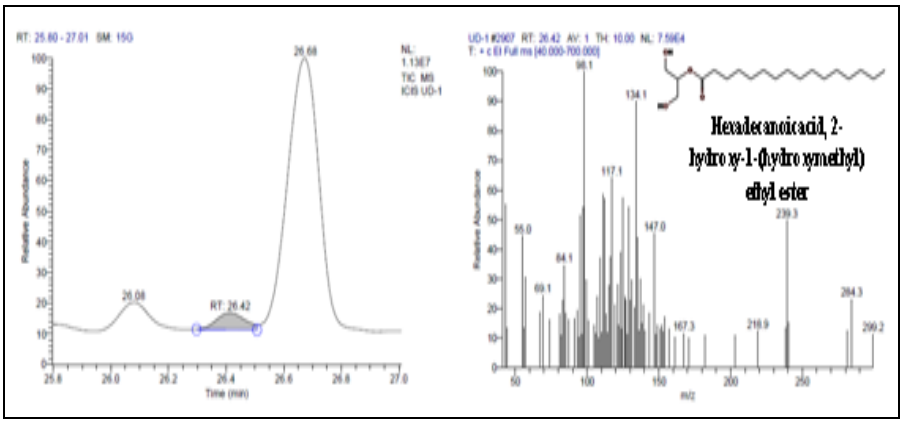


FIG. 19: GC-MS CHROMATOGRAM OF HEXADECANOICACID, 2-HYDROXY-1-(HYDROXYMETHYL) ETHYL ESTER (26.42)

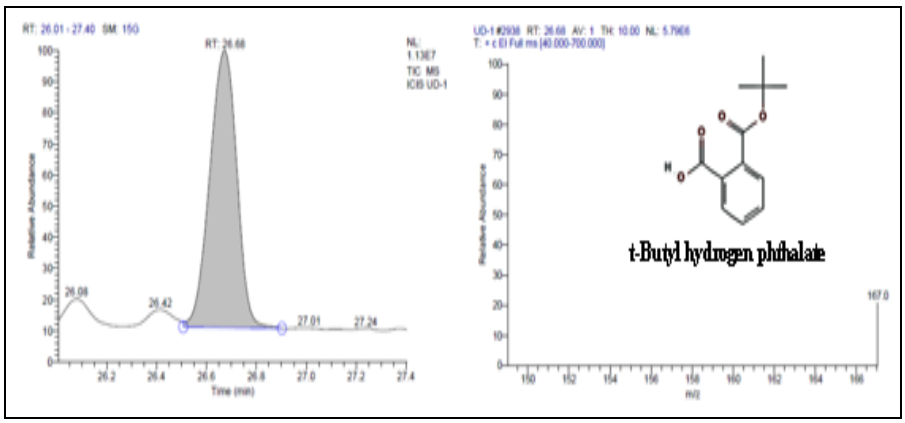


FIG. 20: GC-MS CHROMATOGRAM OF T-BUTYL HYDROGEN PHTHALATE (26.68)

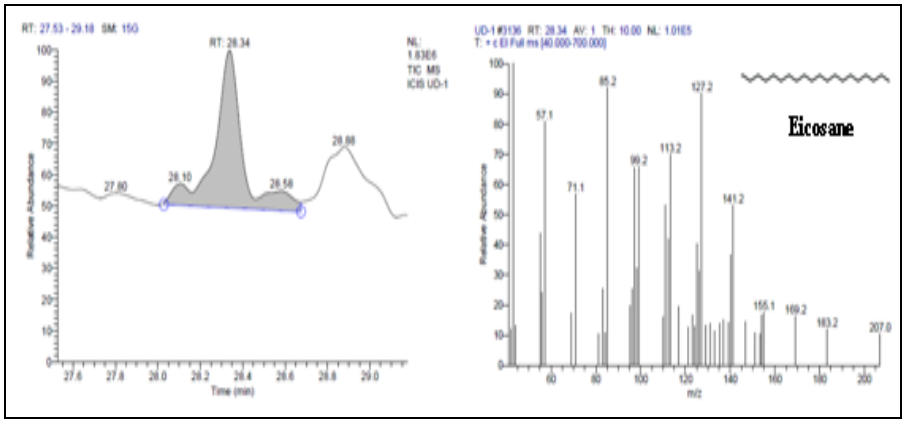


FIG. 21: GC-MS CHROMATOGRAM OF EICOSANE (28.34)

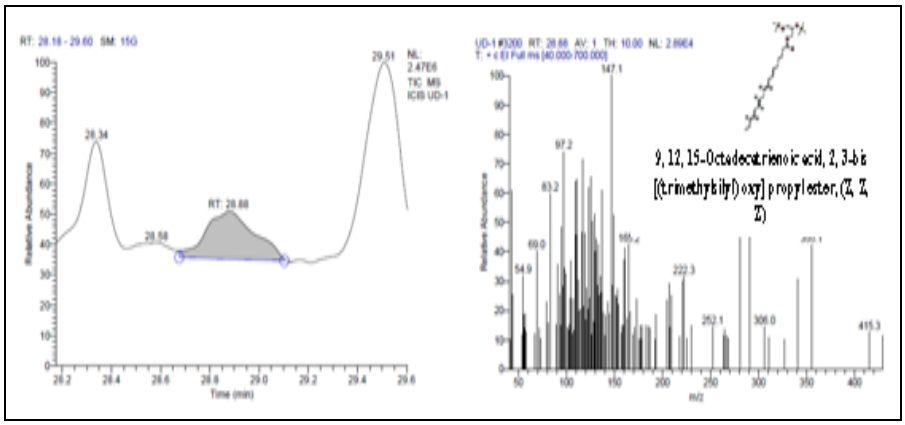


FIG. 22: GC-MS CHROMATOGRAM OF 9, 12, 15-OCTADECATRIENOIC ACID, 2, 3-BIS [(TRIMETHYLSILYL) OXY] PROPYL ESTER, (Z, Z, Z) (28.88)

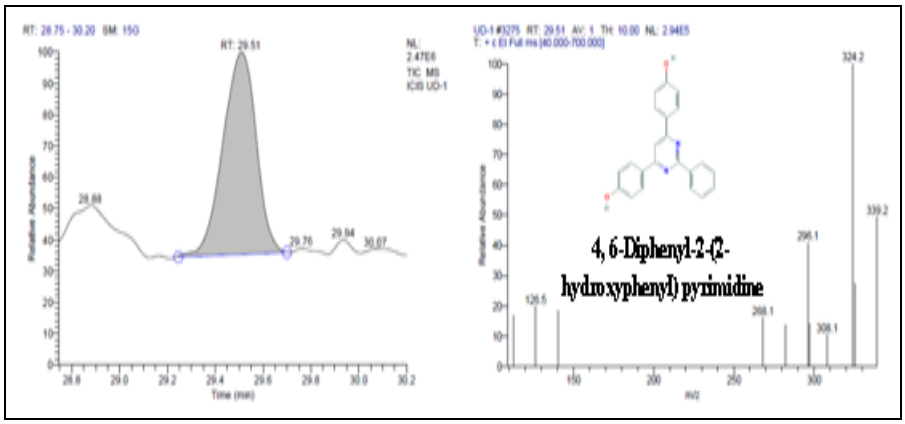


FIG. 23: GC-MS CHROMATOGRAM OF 4, 6-DIPHENYL-2-(2-HYDROXYPHENYL) PYRIMIDINE (28.88)

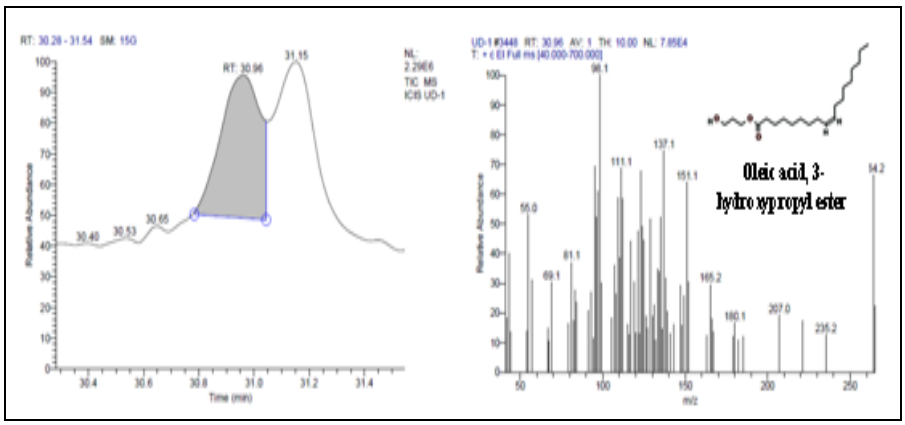


FIG. 24: GC-MS CHROMATOGRAM OF OLEIC ACID, 3-HYDROXYPROPYL ESTER (30.96)

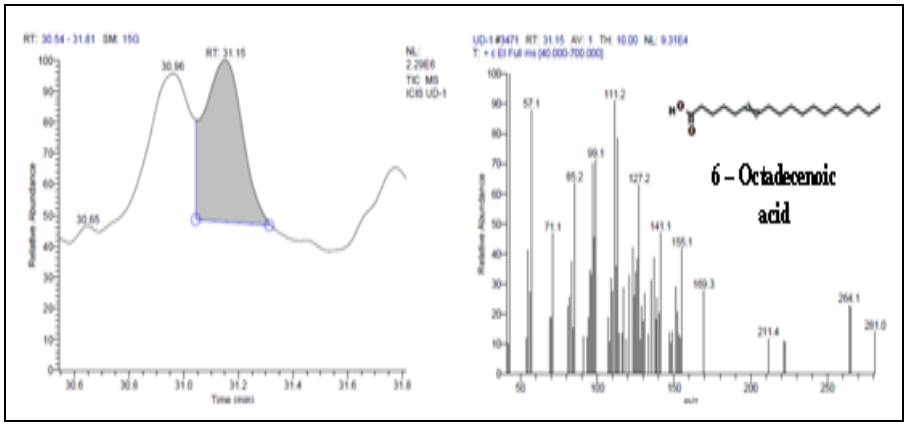


FIG. 25: GC-MS CHROMATOGRAM OF 6 – OCTADECENOIC ACID (31.15)

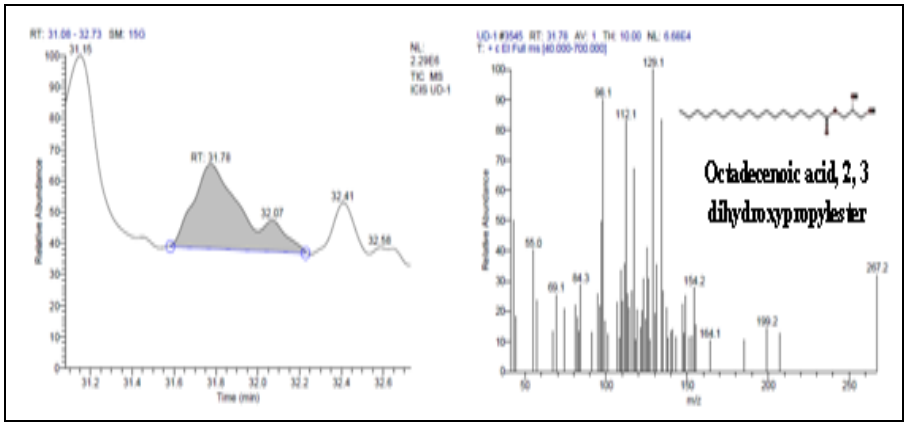


FIG. 26: GC-MS CHROMATOGRAM OF OCTADECENOIC ACID, 2, 3 DIHYDROXYPROPYLESTER (31.78)

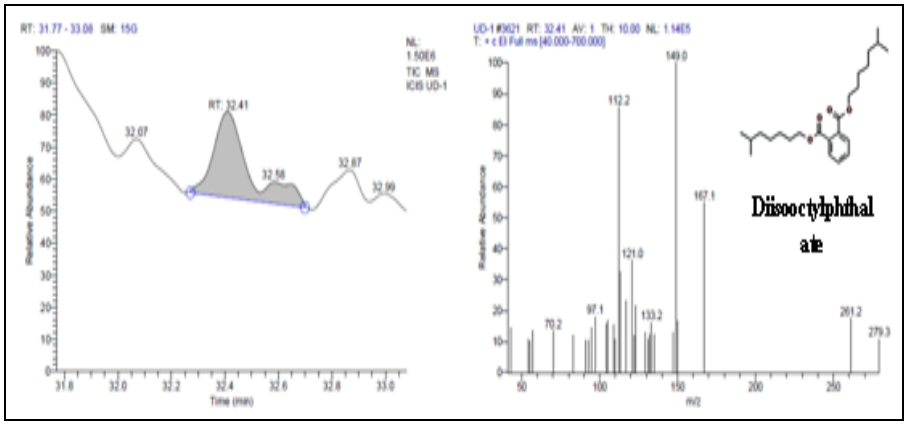


FIG. 27: GC-MS CHROMATOGRAM OF DIISOOCTYLPHTHALATE (32.41)

CONCLUSION: The present investigation concluded that the methanolic extract of leaves of *U. distachya* has several bio-active phyto-components which are responsible for various biological activities. The local tribals and Vaidyas are used in some diseases and disorders. So, further investigation and isolation of newer compounds will be helpful for the study of pharmacological activities.

ACKNOWLEDGEMENT: I am honored to thank the Director and principal of The Pharmaceutical College, Barpali, 768029, for the facilities regarding plant extraction and CIL, Punjab University for providing spectral and analytical data.

CONFLICTS OF INTEREST: We declare that we have no conflicts of interest.

REFERENCE:

1. Thomas GP: High Performance Liquid Chromatography (HPLC) Methods, Benefits and Applications, AZO material 2013; https://www.azom.com/article.aspx?ArticleID=8468,24/08/2021.

2. Bairy Partha Sarathi, a comparison study of HPLC and HPTLC: principles, instrumentations and applications, research gate, ASIO Journal of Analytical Chemistry (ASIO-JAC), Volume 1, 2015, https://www.researchgate.net/publication/318672939
3. CABI, Invasive Species Compendium, https://www.cabi.org/isc/datasheet/9664.
4. Frank M S, Nahata M C and Hilty MD: Glycerol: a review of its pharmacology, pharmacokinetics, adverse reactions, and clinical use, ACCP Journals 1981; 6927604 DOI: 10.1002/j.1875-9114.1981.tb03562.x.
5. Hussein Ameera Omran, Mohammed Ghaidaa Jihadi, Hadi Mohammed Yahya and Hameed Imad Hadi: Phytochemical screening of methanolic dried galls extract of *Quercus infectoria* using gas chromatography-mass spectrometry (GC-MS) and Fourier transform-infrared (FT-IR). Academic Journals 2016; 8(3): Article Number: DB4887957369. ISSN, DOI: 10.5897/JPP2015.0368.
6. Table 2 Pathways responsible for the synthesis of secondary metabolites from S. nigrum. From: Medicinal metabolites with common biosynthetic pathways in Solanum nigrum, Springer Link, https://link.springer.com/article/10.1007/s11816-019-00549-w/tables/2.
7. Hameed Imad Hadi, Hussein J, Kareem Muhanned Abdulhasan and Hamad Nidaa Shihab: Identification of five newly described bioactive chemical compounds in methanolic extract of Mentha viridis by using gas chromatography - mass spectrometry (GC-MS), volume. 7, 2015, Article Number: A1FD61854146. ISSN 2141-2502, DOI: 10.5897/JPP2015.0349.
8. Neepal Imtair Al-Gara: Analysis of bioactive phytochemical compound of (*Cyperus alternifolius* L.) By using gas chromatography –mass spectrometry, IOP Conf. Ser Mater Sci. Eng, 2019, doi:10.1088/1757-899X/571/1/012047.
9. Ponmathisujatha A, Michael Rvanjaline R, muthukumarasamy S barleriacourtallicanees Mohanvr: Determination of bioactive components of *Barleria courtallicanees* (Acanthaceae) by gas chromatography–mass spectrometry analysis. Determination of bioactive components of *Barleria courtallicanees* (Acanthaceae) by gas chromatography–mass spectrometry analysis, 2017, innovare academic sciences PVT LTD, doi: http://dx.doi.org/10.22159/ajpcr.2017.v10i6.18035.
10. Joslen A Nageeb and Ahmed Z Abdel Azeiz: Anticancer Activity of Essential Oil from Lantana camara Flowers against Lung Cancer. Journal of Chemical and Pharmaceutical Research 2018, ISSN: 0975-7384. CODEN (USA): JCPRC5.
11. Malik Bisma, Pirzadah Tanveer Bilal, Tahir Inayatullah barleriacourtallicanees Malik Zainul: Abdin *Barleria courtallicanees* Rehman Reiaz Ul Phytochemical studies on *Cichorium intybus* L. (chicory) from Kashmir Himalaya using GC-MS. J of Pharmacy Res 2016; 10: 0974-6943.
12. Parimalakrishnan S, Akalanka Dey, Rajeswari J and Ravikumar K: Extraction and characterization of phytoconstituents of Cleome chelidonii by GC/MS, International Journal of Chemical and Pharmaceutical Sciences 2015; 6(1): ISSN: 0976-9390.
13. Hussein J. Hussein, Mohammed Yahya Hadi *Barleria courtallicanees* Imad Hadi Hameed: Using Gas Chromatography-Mass Spectrometry (GC-MS) Technique for Analysis of Bioactive Compounds of Methanolic Leaves extract of *Lepidium sativum*, Research Journal of Pharmacy and Technology 2017; DOI: 10.5958/0974-360X.2017.00723.5.
14. Md. Nazneen Bobby, Wesely Edward Gnanaraj, Johnson Marimuthu Alias Antonysamy, AntoArockia Raj Adaikalam *Barleria courtallicanees* Vinnarasi Jamesraj: GC-MS ANALYSIS OF ALBIZIA LEBBECK BENTH, World Journal of Pharmaceutical Research 2015; 4: 1284-1304, ISSN 2277– 7105.
15. Elaiyaraja A and Chandramohan G, Comparative phytochemical profile of *Indoneesiella echioides* (L.) Nees leaves using GC-MS, Journal of Pharmacognosy and Phytochemistry 2016; P-ISSN: 2349-8234. E-ISSN: 2278-4136.
16. Violet Dhayabaran V and Thangarathinam J: Gas Chromatography - Mass Spectroscopy Analysis of *Senna uniflora* (Mill.) Irwin & Barneby Whole Plant. Journal of Natural Products and Resources 2016; ISSN: 2455-0299.
17. Hameed Imad Hadi, Huda Jasim Altameme and Salah Ali Idan: *Artemisia annua*: Biochemical products analysis of methanolic aerial parts extract and antimicrobial capacity. Research Journal of Pharmaceutical Biological and Chemical Sciences 2016; ISSN: 0975-8585.
18. Maghdu Nainamohamed Abubackera and Palaniyappan Kamala Devib: *In-vitro* antifungal potentials of bioactive compound oleic acid, 3-(octadecyloxy) propyl ester isolated from *Lepidagathis cristata* Willd. (Acanthaceae) inflorescence. Asian Pacific Journal of Tropical Medicine, Volume 7, Supplement 1. Pages 2014; 190-193. doi: 10.1016/S1995-7645(14)60230-3.
19. Rajendran P, Bharathidasan R and Sureshkumar K: GC-MS Analysis of Phyto-components in Raw and Treated Sugarcane Juice. International Journal of Current Microbiology and Applied Science 2017; 6: 51-61.
20. Tyagi Tulika and Agarwal Mala: Phytochemical screening and GC-MS analysis of bioactive constituents in the ethanolic extract of Pistia stratiotes L. and *Eichhornia crassipes* (Mart.) solms. Journal of Pharmacognosy and Phytochemistry 2017; 2278-4136.
21. Belakhdar G, Benjouad A and Abdennebi EH: Determination of some bioactive chemical constituents from *Thesium humile* Vahl. J Mater Environ Sci 2015; 6(10): 2778-2783. ISSN: 2028-2508. CODEN: JMESCN.
22. Rajendran P, Bharathidasan R and Sureshkumar K: GC-MS Analysis of Phyto-Components in Raw and Treated Sugarcane Juice. International Journal of Current Microbiology and Applied Sciences 2017; 651-61.
23. Ummu A. Fadzir, Khairani I. Mokhtar, Basma E. Mustafa and Deny S. Darnis: Evaluation of Bioactivaluation of Bioactive Compounds on Diff e Compounds on Different Extrent Extracts of acts of *Linum usitatissimum* and Its Antimicrobial Properties against Selected Oral Pathogens. Makara J. Health Res 2018; 22(3): 121-127. doi: 10.7454/msk.v22i3.10181.
24. Vermaa Rachna, Tapwalb Ashwani, Kumara Dinesh and Puria Sunil: Phytochemical profiling and biological activity of Leucaslanata Benth. An important ethnomedicinal plant of Western Himalaya. Eco Env & Cons 2020; (S169-S175). ISSN 0971–765X.
25. Padmashree M. S, Roopa B, Ashwathanarayana R and Raja Naika: Antibacterial properties of Ipomoea staphylina Roem & Schult. Plant extracts with comparing its preliminary qualitative phytochemical and quantitative GC-MS analysis. Tropical plant research. ISSN (online), 2018; 2349-1183.
26. Ingole Shubhangi Nagorao: Phytochemical analysis of leaf extract of *Ocimum americanum* L. (Lamiaceae) by GCMS method. World Scientific News 2016; 37: 76-87. EISSN 2392-2192.

How to cite this article:
Dash S, Meher A, Dash SK, Das C and Dash SK: GC-MS analysis of methanolic extract of *Urochloa distachya* (L.) T. Q. nguyen, leave. Int J Pharm Sci & Res 2022; 13(6): 2380-94. doi: 10.13040/IJPSR.0975-8232.13(6).2380-94.