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PHYTOCHEMICAL PROFILING OF *OCHNA OBTUSATA DC. VAR. PUMILA* (BUCH.-HAM. EX DC) - AN ENDANGERED ETHNOMEDICINAL PLANT OF JHARKHAND

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ABSTRACT

Ochna obtusata var. pumila is an exotic medicinal plant of Chotanagpur plateau. It is locally called as *Bhuin champa* by the tribals of Jharkhand, and used against asthma, arthritis, diabetes, infantile disease (*rangbaj*), malaria, menstrual disorders and body pain. The phytochemical analysis with various parameters, viz. preliminary, HPLC and GC-MS revealed the presence of pharmaceutically important several compounds, such as *4-Hydroxybenzaldehyde, Quinic acid, β-Stigmasterol* and *β-Sitosterol, Isochiapin B, Squalene, Vitamin E (α-, β-, γ- and δ-Tocopherol), Megastigmatrienone 4, Aromadendrene oxide-(2)* and *Neophytadiene.* Several bioactive compounds have been determined as potent antioxidant, anti-cancerous, antimicrobial, anti-blood cholesterol and anti-inflammatory. The study revealed that the plant is a promising source for the production of many drugs against several human diseases.

KEYWORDS: *Ochna obtusata var. pumila*, Phytochemical, HPLC, GC-MS, Jharkhand.

1. INTRODUCTION

Ochna obtusata var. pumila, belonging to Ochnaceae family is locally called as *Xexel champa, Bhuin champa, Ote champa* and *Ot campa* by the Oraons, Sadani, Munda and Santal tribes of Jharkhand respectively. The plant was reported for the first time from Nepal by Blumea in 1825.[1] However, in Indian subcontinent, Edgeworth (1844) reported the presence of the plant in the Saranda jungles of Jharkhand which was identified as *Ochna obtusata DC. var. pumila* (Buch.-Ham. ex DC.).[2] Subsequently, the plant was also reported from Madhya Pradesh, India in 1989.[3] The plant has been observed also in the jungles of Latehar district of Jharkhand, where the tribals use the roots for various medicinal purposes.

Ochna obtusata var. pumila is a deciduous perennial herb which has stout root stock with leaves simple, alternate and obovate. The flowers are purple or pink in panicles and the fruits drupes with greenish-black colouration.[4] The habit, flowers and roots are given in **Fig. 1.**

The ethnobotanical survey (2015-2017) in different districts of Jharkhand revealed that various tribal groups use the roots of the plant in different formulations for several diseases. The Munda and the Santal tribes apply the root paste for body pain, while the root suspension is taken orally for diarrhoea and dysentery. The root tablets are consumed with a glass of locally brewed drink (*handia*) for the treatment of menstrual disorders. The Oraon tribals administer the root paste with honey to treat *rangbaj* (typical sickness in infants) in children. They also give the paste added with black pepper for the treatment of malaria. Like Mundas and Santals, the Oraons also administer root paste with a glass of *handia* to treat menstrual complaints. A pinch of root powder with a spoonful of honey is given for asthma. Some tribes use the root decoction with rock salt and black pepper to treat diabetes.

In spite of several uses, there isn't any published literature with regard to phytochemical determination of bioactive compounds. Hence, the present study is aimed at to investigate and characterize the bioactive compounds using High Performance Liquid Chromatography (HPLC) and Gas Chromatography–Mass Spectrometry (GC–MS) in the crude extracts of the root and leaf of *Ochna obtusata var. pumila*.

2. MATERIALS AND METHOD

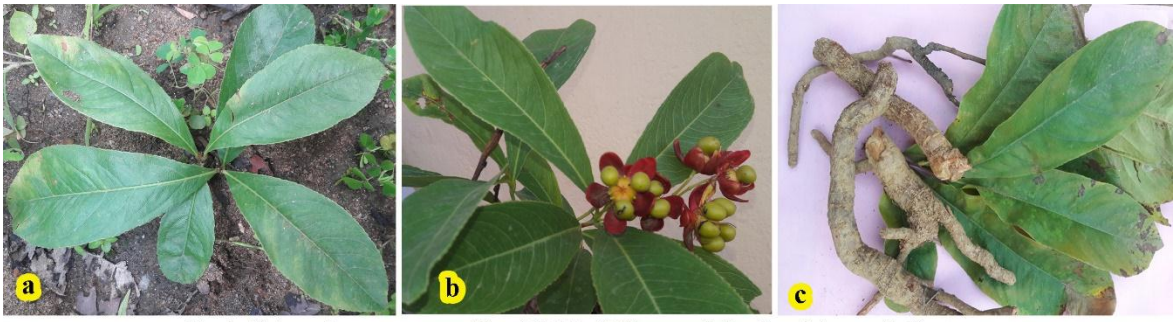


Fig. 1: ***Ochna obtusata var. pumila:*** **a) Habit b) Flowers & Fruits c) Aromatic Roots**

2.1. Collection of Plant Materials

Fresh roots and leaves of *Ochna obtusata var. pumila* were collected from different locations of Latehar District, viz. Mahuadanr hills and Latehar jungles in February, 2017. The plant was identified and authenticated by Dr. S. John Britto of the Rapinat Herbarium, St. Joseph's College, Trichy, Tamilnadu. The voucher specimens were deposited in the same herbarium

with accession numbers RHT 67036 and RHT 67059. The different habits, roots, leaves, flowers and seeds of the plant were photographed and deposited.

2.2. Extraction of Phytochemicals

The roots and leaves of *O. obtusata var. pumila* were dried under shade at room temperature for a period of two weeks. The dried roots and leaves were powdered mechanically and kept in the air-tight containers. 10g of the powder was extracted with 50 ml of methanol in a rotary shaker for 72 hours. The extract was concentrated and dried by evaporation.

2.3. Preliminary Phytochemical Investigations

Preliminary phytochemical analysis of the extracts of roots and leaves of *O. obtusata var. pumila* was carried out by standard methods adopting from various sources.[5-8] The bioactive compounds such as alkaloids, carbohydrates, flavonoids, glycosides, phenols, saponins, tannins, terpenoids, etc. were screened.

2.4. HPLC and GC-MS Analysis of *Ochna obtusata var. pumila*

The extracts of roots and leaves of *O. obtusata var. pumila* were subjected to analytical HPLC adopting the standard procedures and conditions.[9] The 2ml of extract was filtered through 0.2µm filter. Then 20µl sample was injected into Shimadzu HPLC equipped with auto-sampler and diode array detector. Acetonitrile and HPLC grade water were used as solvents for gradient elution. The running time consisted of 25 minutes and the chromatograms were obtained at 254nm.

The GC-MS analysis was carried out in GC-MS Shimadzu instrument, model QP2010S with column specifications as follows- Rxi-5Sil MS, 30 meter length, 0.25mm ID, 0.25µm thickness. The injected volume was 1.0mL and the run time was 40 min with specific conditions as follows- Column Oven Temp. :100.0 °C; Injection Temp. :260.00 °C; Injection Mode :Splitless; Sampling Time :2.00 min; Flow Control Mode :Linear Velocity; Pressure :73.0 kPa; Total Flow :104.0 mL/min; Column Flow :1.00 mL/min; Linear Velocity :37.2 cm/sec; Purge Flow :3.0 mL/min; Split Ratio :100.0. The software used was GCMS Solutions, while NIST 11 and WILEY 8 libraries were used for the identification and interpretation of compounds by comparison of mass spectra of the samples. The molecular formula, molecular weight and molecular structures of the compounds were determined from the database of PubChem[10] and Chem Spider.[11] The uses and biological activities of the compounds were studied from various sources.

3. RESULTS AND DISCUSSION

3.1 Results of Preliminary Tests: The results of the preliminary phytochemical screening are tabulated in **Table 1**. The root extract showed the presence of carbohydrates, flavonoids, steroids, cardiac glycosides, phenols, tannins and saponins, while the alkaloids were absent. The leaf extract showed the presence of alkaloids, carbohydrates, cardiac glycosides, phenols and tannins. Starch, flavonoids and saponins were absent in the leaf. Both the root and leaf showed the absence of starch, anthral glycosides, proteins and free amino acids. However, the root and the leaf showed the presence of cardiac glycosides in high concentration. They also exhibited the presence of reducing sugars.

Table. 1: Phytochemical screening of Methanolic Extracts of *Ochna obtusata var. pumila.*

S. No.	Phytochemicals	Tests	Root Extract	Leaf Extract
1	Alkaloids	Hager's	–	++
		Mayer's	–	+
2	Carbohydrates	Molisch's	+	+
		Benedict's	++	+
3	Starch	Iodine	–	–
4	Flavonoids	Shinoda	+	–
		Pew's	+	–
5	Steroids	Salkowski's	+	+
		Kiliani's	+	–
6	Anthral Glycosides	KOH test	–	–
7	Cardiac glycosides	Keller Kiliani	+++	+++
8	Proteins	Xanthoproteic	–	–
9	Amino acids	Ninhydrin	–	–
10	Phenols	$FeCl_3$ test	++	++
		Lead acetate	++	++
11	Tannins	$FeCl_3$ test	++	++
		Lead acetate	++	++
12	Saponins	Foam test	+++	–

Very high (++++), high (+++), moderate (++), low (+) and nil (–).

3.2. Results of HPLC Analysis of *O. obtusata var. pumila*

The HPLC analysis of the extracts of root and leaf of *Ochna obtusata var. pumila* produced 7 and 6 peaks respectively (Fig. 2 and 3). The details of the analysis such as retention time, area, height, area percentage and height percentage are given in Tables 2 and 3. Both the plant parts, viz. root and leaf produced almost the similar number of peaks. It is evident from the results that the root as well as the leaf possesses higher number bioactive compounds.

Among them, peaks #1 and #2 exhibited greater area percentage in the root as well as the leaf indicating the presence of two compounds in greater amounts in both the plant parts.

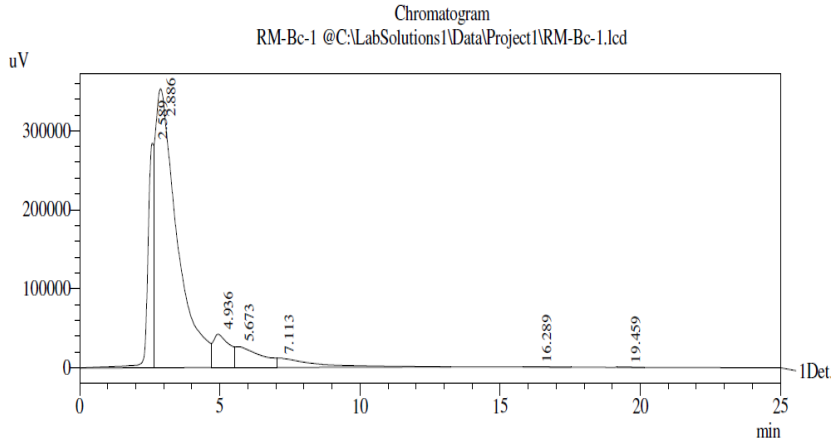


Fig. 2. HPLC Chromatogram of Root extract of *O. obtusata var. pumila.*

Table. 2: HPLC Detection of Root Extract of *O. obtusata var. pumila.*

Peak#	Ret. Time	Area	Height	Area %	Height %
1	2.589	3896581	284056	14.152	39.587
2	2.886	19163226	352830	69.598	49.171
3	4.936	1721041	42161	6.251	5.876
4	5.673	1655576	26463	6.013	3.688
5	7.113	1083109	11699	3.934	1.630
6	16.289	11216	254	0.041	0.035
7	19.459	3257	92	0.012	0.013
Total		**27534006**	**717555**	**100.000**	**100.000**

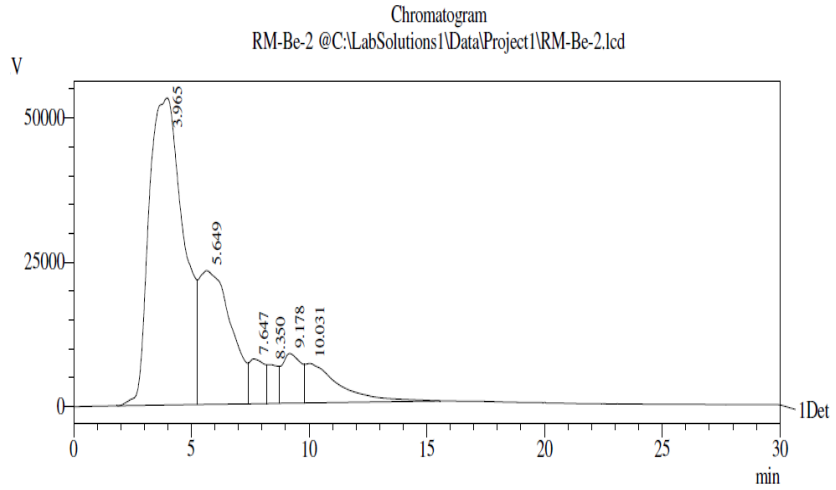


Fig. 3. HPLC Chromatogram of Leaf extract of *O. obtusata var. pumila.*

Table. 3: HPLC detection of Leaf Extract of *O. obtusata var. pumila.*

Peak#	Ret. Time	Area	Height	Area %	Height %
1	3.965	5393123	53180	57.856	50.021
2	5.649	2190225	23182	23.496	21.805
3	7.647	357573	7771	3.836	7.309
4	8.350	208065	6746	2.232	6.346
5	9.178	483327	8588	5.185	8.078
6	10.031	689252	6847	7.394	6.440
Total		**9321564**	**106314**	**100.000**	**100.000**

3.3. GC-MS Analysis of *Ochna obtusata var. pumila*

GC-MS analysis of the extracts of root and leaf of the sampled plant revealed 34 and 48 bioactive components respectively (Table 4 and 5). The bioactive compounds are tabulated along with their retention time, area percentage, height percentage and their uses / bioactivities. The chromatograms of the root and leaf extracts are given in Fig. 4 and 5 respectively.

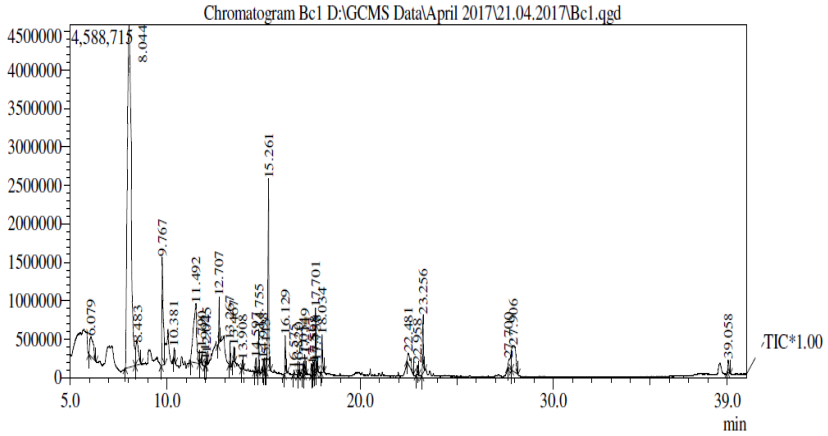


Fig. 4. GC-MS Chromatogram of Root extract of *O. obtusata var. pumila.*

Table. 4: Bioactive compounds detected in the Root extract of *O. obtusata var. pumila.*

Peak No.	RT	Area %	Height %	M.F. & (M.W.)	Name of Bioactive Compound	Uses / Bioactivity
1	6.079	2.81	1.49	$C_7H_8O_3$ (140.137)	5-Hydroxymethylfurfural	Treatment of sickle cell disease[12], wine storage time-temp. marker[13]
2	8.044	52.78	26.82	$C_7H_6O_2$ (122.121)	4-Hydroxybenzaldehyde	Antioxidant and GABAergic neuromodulator[14]
3	8.483	2.66	1.65	$C_{17}H_{26}O_{11}$ (406.382)	Methyl 2,3,6,7-tetra-O-acetyl-4-O-methylheptopyranoside	N.R.
4	9.767	5.98	8.49	$C_{14}H_{22}O$ (206.324)	Phenol, 2,4-bis(1,1-dimethylethyl)-	N.R.
5	10.381	0.36	0.94	$C_{12}H_{24}O_2$ (200.318)	DODECANOIC ACID	Acne treatment[15], increases high-density lipoprotein[16]
6	11.492	8.16	4.66	$C_7H_{12}O_6$ (192.167)	(1R,3R,4R,5R)-(-)-QUINIC ACID	Starting material for synthesis of medicine for treatment of influenza A and B
7	11.790	0.29	0.57	$C_{16}H_{34}O$ (242.441)	1-HEXADECANOL	Emulsifier in cosmetics and pharmaceuticals[10,17]
8	1.992	0.11	0.33	$C_{16}H_{13}N_3O_2$ (279.293)	2-Amino-6-isopropyl-10-oxo-10H-9-oxa-1-aza-anthracene-3-carbonitrile	N.R.
9	12.045	0.37	0.95	$C_{23}H_{48}$ (324.627)	TRICOSANE	N.R.
10	12.707	1.02	3.57	$C_{14}H_{28}O_2$ (228.376)	TETRADECANOIC ACID	Soaps & Cosmetics; Surfactant; Cleansing Agent; Emulsifier; lubricant[10]
11	13.267	0.56	1.84	$C_{17}H_{36}O$ (256.467)	3-HEPTADECANOL	N.R.
12	13.467	0.42	1.20	$C_{17}H_{34}O_2$ (270.451)	ISOPROPYL MYRISTATE	Flavouring Agents in food additives[10], mouth wash, solvent in perfume, flea and tick products for pets.
13	13.908	0.17	0.66	$C_{15}H_{30}O_2$ (242.398)	PENTADECANOIC ACID	Adhesives and sealant, lubricants and lubricant additives[10]
14	14.597	0.36	1.02	$C_{20}H_{42}$	EICOSANE	N.R.

				(282.547)		
15	14.755	0.89	3.32	$C_{17}H_{34}O_2$ (270.451)	Hexadecanoic acid, methyl ester	Flavouring agent in food additives, laundry and dishwashing products[10]
16	14.998	0.25	0.84	$C_{12}H_{18}$ (162.271)	1-(3-Methyl-cyclopent-2-enyl)-cyclohexene	N.R.
17	15.113	0.12	0.47	$C_7H_{16}O$ (116.201)	3-PENTANOL, 3-ETHYL-	N.R.
18	15.261	6.94	15.00	$C_{16}H_{32}O_2$ (256.424)	HEXADECANOIC ACID	Soaps, cosmetics, food additives[10], antioxidant, hypocholesterolemic[18]
19	16.129	1.19	2.94	$C_{14}H_{15}P$ (214.243)	Ethyldiphenylphosphine	N.R.
20	16.575	0.08	0.33	$C_{17}H_{34}O_2$ (270.451)	HEPTADECANOIC ACID	Surfactant, adhesives, sealant lubricants and lubricant additives[10]
21	16.820	0.13	0.40	$C_{10}H_{20}O$ (156.265)	Cyclohexanol, 1-butyl-	N.R.
22	17.054	0.29	0.82	$C_{19}H_{34}O_2$ (294.472)	9,12-Octadecadienoic acid, methyl ester	N.R.
23	17.149	0.48	1.51	$C_{19}H_{36}O_2$ (296.488)	9-Octadecenoic acid (Z)-, methyl ester	Food flavouring Agent, absorbents, lubricant additives[10], emulsifying agent, emollient, excipient[19]
24	17.517	0.24	0.79	$C_{19}H_{38}O_2$ (298.504)	METHYL STEARATE	Food flavouring agent[10]
25	17.598	0.32	0.89	$C_{18}H_{32}O_2$ (280.445)	9,12-OCTADECADIENOIC ACID	Flavouring, anti-inflammatory, acne reductive, skin-lightening and skin moisturiser[20, 21]
26	17.701	1.95	5.05	$C_{18}H_{34}O_2$ (282.461)	CIS-VACCENIC ACID	Lowers cholesterol, LDL cholesterol and triglyceride levels[22]
27	17.758	0.21	0.75	$C_{18}H_{34}O_2$ (282.461)	9-OCTADECENOIC ACID (Z)-	In oleates and lotions, as pharmaceutical solvent[10]
28	18.034	1.18	2.97	$C_{18}H_{36}O_2$ (284.477)	OCTADECANOIC ACID	Flavouring, soaps, cosmetics, detergents, lubricants, insecticide, herbicide[10]

29	22.481	1.32	0.79	$C_{29}H_{48}O$ (412.691)	BETA-STIGMASTEROL	Reduces prostatic hyperplasia and blood cholesterol[23, 24]
30	22.958	0.31	0.76	$C_{21}H_{44}O$ (312.573)	1-HENEICOSANOL	Antibacterial activity[25]
31	23.256	2.04	4.57	$C_{19}H_{38}O_4$ (330.503)	Palmitic acid .beta.-monoglyceride	N.R.
32	27.700	1.37	0.67	$C_{39}H_{76}O_5$ (625.018)	1,3-DISTEARIN GLYCERIDE	N.R.
33	27.906	4.08	2.01	$C_{29}H_{50}O$ (414.707)	BETA-SITOSTEROL	Reduces prostatic hyperplasia and blood cholesterol[23, 24]
34	39.058	0.57	0.95	$C_{29}H_{50}O_2$ (430.706)	DL-.ALPHA.-TOCOPHEROL	Vit. E, potent antioxidant[10]

RT-Retention Time; M.F.-Molecular Formula; M.W.-Molecular Weight; N.R.-No References found.

The root exhibited the presence of several pharmaceutically important bioactive compounds whose bioactivities have already been determined. Moreover, the compounds showed greater area percentage indicating their presence in higher amount, such as *5-Hydroxymethylfurfural (2.81), 4-Hydroxybenzaldehyde (52.78), Quinic acid (8.16), Hexadecanoic acid (6.94), cis-Vaccenic acid (1.95), Octadecanoic acid (1.18), beta-Stigmasterol (1.32),* and *beta-Sitosterol (4.08).* It is evident from the data that the root could be a potent source of harvesting important bioactive compounds.

Furthermore, the root exhibited the presence of several compounds with greater area percentage whose biological activities are yet to be discovered. They are - *Methyl 2,3,6,7-tetra-O-acetyl-4-O-methylheptopyranoside (2.66), Phenol, 2,4-bis(1,1-dimethylethyl)- (5.98), Palmitic acid.beta.-monoglyceride (2.04),* and *1,3-Distearin glyceride (1.37).*

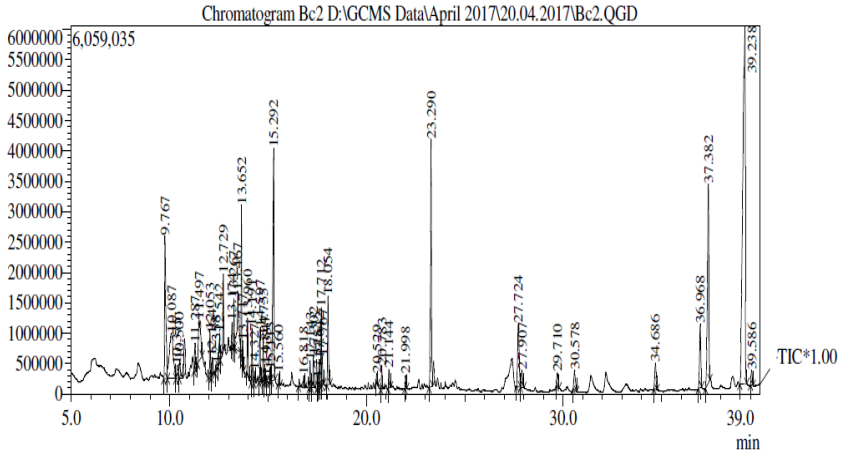


Fig. 5. GC-MS Chromatogram of Leaf extract of *O. obtusata var. pumila.*

Table. 5: Bioactive compounds detected in Leaf extract of *O. obtusata var. pumila.*

Peak #	RT	Area %	Height %	M.F. & (M.W.)	Name of Compound	Uses / Bioactivity
1	9.767	5.54	5.38	$C_{14}H_{22}O$ (206.324)	Phenol, 2,4-bis(1,1-dimethylethyl)-	precursor to complex antioxidants[10]
2	10.087	5.29	1.70	$C_6H_{12}O_6$ (180.156)	D-Allose	N.R.
3	10.375	0.69	0.47	$C_{12}H_{24}O_2$ (200.318)	DODECANOIC ACID	In soaps and cosmetics, acne treatment[26]
4	10.500	0.72	0.65	$C_{10}H_{16}O_2$ (168.233)	2-Cyclohexen-1-one, 2-hydroxy-6-methyl-3-(1-methylethyl)-	N.R.
5	11.287	0.82	1.03	$C_{13}H_{18}O$ (190.281)	MEGASTIGMATRIENONE 4	N.R.
6	11.497	2.88	1.52	$C_{12}H_{22}$ (166.303)	3,4,5,6-Tetramethyl-2,5-octadiene	N.R.
7	12.053	1.15	1.71	$C_{18}H_{37}Cl$	OCTADECANE, 1-CHLORO-	N.R.

				(288.939)		
8	12.164	0.42	0.69	$C_{13}H_{22}O_2$ (210.313)	2-Cyclohexen-1-one, 4-(3-hydroxybutyl)-3,5,5-trimethyl-	N.R.
9	12.358	0.16	0.27	$C_{21}H_{41}ClO_2$ (361.002)	5-Chlorovaleric acid, hexadecyl ester	N.R.
10	12.542	1.05	1.11	$C_{19}H_{26}O_6$ (350.172)	ISOCHIAPIN B	Anti-insect, antimicrobial, antioxidant, anticancer[27]
11	12.729	1.73	2.93	$C_{14}H_{28}O_2$ (228.371)	MYRISTIC ACID	Flavouring agent[10]
12	13.174	0.65	0.90	$C_{13}H_{20}O_2$ (208)	PLUCHIDIOL	N.R.
13	13.267	0.89	1.83	$C_{17}H_{36}O$ (256.467)	3-HEPTADECANOL	N.R.
14	13.467	3.07	2.23	$C_{17}H_{34}O_2$ (270.451)	ISOPROPYL MYRISTATE	In cosmetics, emollient, skin enhancer, pesticide against head lice
15	13.652	2.43	5.76	$C_{20}H_{38}$ (278.515)	NEOPHYTADIENE	N.R.
16	13.717	0.38	0.93	$C_{18}H_{36}O$ (268.478)	2-Pentadecanone, 6,10,14-trimethyl-	N.R.
17	13.960	1.30	2.13	$C_{13}H_{22}O$ (194.313)	2(1H)-Benzocyclooctenone, decahydro-10a-methyl-, trans-	N.R.
18	14.191	0.97	2.04	$C_{22}H_{42}O_2$ (338.568)	PHYTOL, ACETATE	Food additive[10]
19	14.327	0.22	0.40	$C_{10}H_{15}NO_3$ (197.231)	3,5-Dimethoxy-4-hydroxyphenethylamine	N.R.
20	14.597	1.14	2.03	$C_{14}H_{29}Br$ (277.284)	2-Bromotetradecane	N.R.
21	14.755	0.68	1.70	$C_{17}H_{34}O_2$ (270.451)	Hexadecanoic acid, methyl ester	Flavouring agent, laundry and dishwash products[10]
22	14.847	0.37	0.71	$C_{19}H_{34}O_2$ (294.472)	9,12-OCTADECADIENOIC ACID, METHYL ESTER, (E,E)-	N.R.

23	14.933	0.02	0.23	$C_{16}H_{30}O_2$ (254.408)	PALMITOLEIC ACID	Adhesives, sealants, lubricant additive[10]
24	15.113	0.16	0.41	$C_7H_{16}O$ (116.201)	3-PENTANOL, 3-ETHYL-	N.R.
25	15.292	7.75	8.71	$C_{16}H_{32}O_2$ (256.424)	HEXADECANOIC ACID	Flavouring agent[10], soaps, cosmetics; increase blood LDL level[28], boosts metastasis of oral cancer cells[29]
26	15.560	0.20	0.40	$C_{17}H_{26}O_3$ (278.387)	Benzoic acid, 3,5-bis(1,1-dimethylethyl)-4-hydroxy-, ethyl ester	N.R.
27	16.818	0.47	0.45	$C_{10}H_{20}O$ (156.265)	Cyclohexanol, 1-butyl-	N.R.
28	17.143	0.53	1.01	$C_{19}H_{32}O_2$ (292.456)	METHYL LINOLENATE	Flavouring ingredient[10]
29	17.302	0.71	1.23	$C_{20}H_{40}O$ (296.531)	PHYTOL	Flavouring agent[10]
30	17.525	0.16	0.35	$C_{19}H_{38}O_2$ (298.504)	OCTADECANOIC ACID, METHYL ESTER	Flavouring agent[10]
31	17.612	0.72	0.99	$C_{18}H_{32}O_2$ (280.445)	LINOLEIC ACID	Anti-inflammatory, acne reductive, skin-lightening and moisturiser[21]
32	17.712	1.92	2.92	$C_{14}H_{26}O$ (210.356)	7-TETRADECENAL, (Z)-	N.R.
33	17.767	0.53	1.05	$C_{18}H_{34}O_2$ (282.461)	cis-13-Octadecenoic acid	Anti-inflammatory, hypocholesterolemic, Anti-histaminic, anti-acne, anti-arthritic[18]
34	18.054	2.35	3.32	$C_{18}H_{36}O_2$ (284.477)	OCTADECANOIC ACID	Flavouring agent, herbicide, nematicide[18]
35	20.529	0.15	0.37	$C_{20}H_{42}$ (282.547)	PHYTANE	Bio-marker in petroleum studies[30]

36	20.783	0.49	0.88	$C_{21}H_{40}O_2$ (324.541)	4,8,12,16-Tetramethylheptadecan-4-olide	N.R.
37	21.144	0.49	0.70	$C_{19}H_{26}O_6$ (350.172)	ISOCHIAPIN B	Anti-insect, antimicrobial, antioxidant, anticancer[27]
38	21.998	0.31	0.49	$C_{15}H_{24}O$ (220.350)	Aromadendrene oxide-(2)	N.R.
39	23.290	7.54	9.28	$C_{19}H_{38}O_4$ (330.503)	Palmitic acid, beta-monoglyceride	N.R.
40	27.724	2.83	2.36	$C_{21}H_{42}O_4$ (358.556)	alpha-Monostearin	Emulsifier, solidifier, surfactant[10, 31]
41	27.907	0.74	0.64	$C_{21}H_{34}O_2$ (318.493)	4-Pregnene-3.beta.,20.beta.-diol	N.R.
42	29.710	0.51	0.52	-	<NO NAME>	-
43	30.578	0.86	0.75	$C_{30}H_{50}$ (410.718)	SQUALENE	Adjuvant in vaccines[32] anticancer, antioxidant, drug carrier, detoxifier, skin hydrating, emollient[33]
44	34.686	1.01	0.96	$C_{27}H_{46}O_2$ (402.653)	DELTA-TOCOPHEROL	Vit. E, food additive, free radical scavenger[10]
45	36.968	2.35	2.38	$C_{28}H_{48}O_2$ (416.680)	beta-Tocopherol	Vit. E, food additive, inhibits oxidation reactions in tissues[10]
46	37.382	8.23	7.49	$C_{28}H_{48}O_2$ (416.680)	gamma-Tocopherol	Vit. E, food additive, antioxidant[10]
47	39.238	25.89	13.46	$C_{29}H_{50}O_2$ (430.706)	dl-alpha-Tocopherol	Vit. E, food additive, potent antioxidant[10]
48	39.586	0.52	0.55	$C_{31}H_{54}O_2$ (458.759)	Tetracosa-2,6,10,14,18-pentaen-22-ol, 2,6,10,15,19,23-hexamethyl-23-methoxy-, alltrans	N.R.

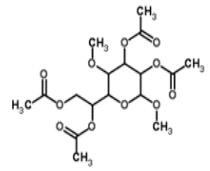
RT-Retention Time; M.F.-Molecular Formula; M.W.-Molecular Weight; N.R.-No References found.

It was interesting to note that the leaf exhibited higher number of compounds than the root. Pharmaceutically important bioactive compounds which showed higher area percentage are as follows - *Phenol, 2,4-bis(1,1-dimethylethyl)- (5.54), Isochiapin B (1.54), Myristic acid (1.73), Isopropyl myristate (3.07), Hexadecanoic acid (7.75), Octadecanoic acid (2.35), alpha-Monostearin (2.83), α-Tocopherol (25.89), β-Tocopherol (2.35), γ-Tocopherol (8.23),* and *δ-Tocopherol (1.01).* It is evident by the presence of all Tocopherols that leaf could be a great source of Vitamin E.

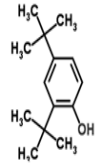
Moreover, the leaf exhibited several compounds with higher area percentage, whose uses or biological activities are still unknown. They are - *D-Allose (5.29), 3,4,5,6-Tetramethyl-2,5-octadiene (2.88), Neophytadiene (2.43), 7-Tetradecenal (1.92),* and *Palmitic acid, beta-monoglyceride (7.54).*

It was surprising to detect several compounds, both in root and leaf, whose bioactivities could not be confirmed. The compounds detected in root extract are - *2-Amino-6-isopropyl-10-oxo-10H-9-oxa-1-aza-anthracene-3-carbonitrile; Tricosane; 3-Heptadecanol; Eicosane; 1-(3-Methyl-cyclopent-2-enyl)-cyclohexene; 3-Pentanol, 3-ethyl-; Ethyldiphenylphosphine; Cyclohexanol, 1-butyl-; 9,12-Octadecadienoic acid, methyl ester*, while the compounds detected in leaf extract are - *2-Cyclohexen-1-one, 2-hydroxy-6-methyl-3-(1-methylethyl)-; Megastigmatrienone 4; Octadecane, 1-chloro-; Pluchidiol; 3-Heptadecanol; 2-Pentadecanone, 6,10,14-trimethyl-; Cyclohexanol, 1-butyl-; Aromadendrene oxide-(2); 4-Pregnene-3.beta.,20.beta.-diol*, etc.

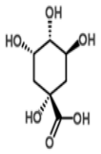
The chemical structures of some of the pharmaceutically important bioactive compounds are given below



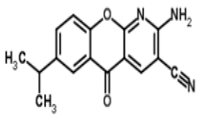
Methyl 2,3,6,7-tetra-O-acetyl-4-O-methylheptopyranoside



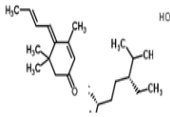
Phenol, 2,4-bis(1,1-dimethylethyl)-



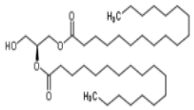
Quinic acid



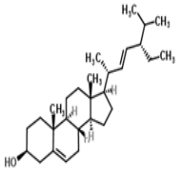
2-Amino-6-isopropyl-10-oxo-10H-9-oxa-1-aza-anthracene-3-carbonitrile



Megastigmatrienone 4

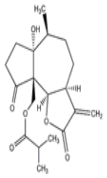


1,3-Distearin glyceride

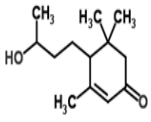


beta-Stigmasterol

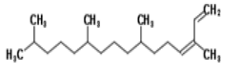
beta-Sitosterol



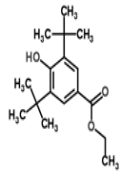
Isochiapin B



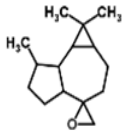
2-Cyclohexen-1-one, 4-(3-hydroxybutyl)-3,5,5-trimethyl-



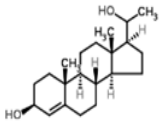
Neophytadiene



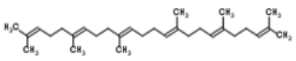
Benzoic acid, 3,5-bis(1,1-dimethylethyl)-4-hydroxy-, ethyl ester



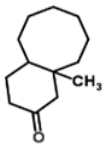
Aromadendrene oxide-(2)



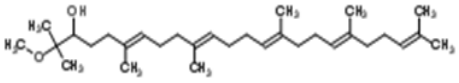
4-Pregnene-3.beta.,20.beta.-diol



Squalene



2(1H)-Benzocyclooctenone, decahydro-10a-methyl-, trans-



Tetracosa-2,6,10,14,18-pentaen-22-ol, 2,6,10,15,19,23-hexamethyl-23-methoxy-, alltrans

16

4. CONCLUSION

It is the first time study of the plant, *Ochna obtusata var. pumila* which is being reported with its phytochemical profiles. The phytochemical assays revealed the presence of important bioactive compounds in root, such as flavonoids, steroids and cardiac glycosides. On the other hand, leaf exhibited the presence of alkaloids, steroids and cardiac glycosides. The HPLC and GC-MS analysis determined the presence of several steroidal, alkaloidal and glycosidic compounds which may be responsible for synergistic healing of several diseases such as asthma, bronchitis, diarrhoea, dysentery and infantile diseases against which the plant is used. Moreover, the root of *O. obtusata var. pumila* is a promising biomedical resource of

drugs, such as *4-Hydroxybenzaldehyde* (active antioxidant and GABAergic neuromodulator), *Quinic acid* (influenza drug synthesis), *β-Stigmasterol* and *β-Sitosterol* (drugs for prostatic hyperplasia and high blood cholesterol). On the other hand, the leaf also could be a great source of pharmaceutically and industrially important drugs such as *Isochiapin B* (antimicrobial, antioxidant, anticancer), *Squalene* (drug carrier, antioxidant, anticancer) and *Vitamin E* (potent antioxidant). Additionally, the leaf unveiled itself to be a store house of α-, *β*-, γ- and δ-Tocopherol. Hence, the present study could open a new pathway for further research and production of drugs at low cost to cure several diseases.

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6. CONFLICT OF INTEREST

The author has declared no conflict of interest.

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