International Journal of
Life Sciences
International Peer Reviewed Open Access Refereed Journal

Int. J. of Life Sciences, 2022; 10 (1):47-53
ISSN:2320-7817(p) | 2320-964X(o)

Research Article Open Access

GC-MS Analysis of Bioactive Compound in Bark Extract of *Butea monosperma* (Lam) Taub. in Jharkhand

Bishnu Prasad[1] and Agatha Sylvia Khalkho[2]

[1]Research scholar, Department of Botany, Ranchi University, Ranchi, Jharkhand, India-834001
[2]Associate Professor, Department of Botany (Centre for Biotechnology) Marwari College, Ranchi University, Ranchi, Jharkhand, India-834001

Manuscript details:

Received: 13.01.2022
Accepted: 25.02.2022
Published: 27.02.2022

Cite this article as:
Bishnu Prasad and Agatha Sylvia Khalkho (2022) GC-MS Analysis of Bioactive Compound in Bark Extract of *Butea monosperma* (Lam) Taub. in Jharkhand, *Int. J. of Life Sciences*, 10 (1): 47-53.

Available online on http://www.ijlsci.in
ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

ABSTRACT

Plants produce a diverse range of bioactive molecules, making them rich sources of different types of medicine. An essential part in the investigation of plant is the identification of the biologically active compounds present in plant leading to further biological and pharmacological studies. The bark of *Butea monosperma* was collected from the Kulhi Jungle at Panchyat Kuchu of Block Ormanjhi in Ranchi District of Jharkhand. 1.5 ml of extract in a GC vial was subjected to the GC-MS equipment. The biomolecules investigation of organic extract was performed by GC-MS equipment (GCMS-QP2010 Ultra). Bis(2-ethylhexyl) phthalate and Lup-20(29)-en-3-one were abundant in the organic extract which also express apoptosis inhibitor and anti-HIV properties and anti-bacterial activities respectively.

Keywords: Bark, Butea monosperma, GCMS, Bis(2-ethylhexyl) phthalate, Lup-20(29)-en-3-one

INTRODUCTION

Plants produce a diverse range of bioactive molecules, making them rich sources of different types of medicine (Nair *et al.*, 2017). An essential part in the investigation of plant is the identification of the biologically active compounds present in plant leading to further biological and pharmacological studies (Farid *et al.*, 2015; Guo *et al.*, 2013). *Butea monosperma* also called Palash, is commonly known as the Flame of the forest, belongs to the family Fabaceae (Patil *et al.*, 2014). Bark is having anti-microbial properties, anti-fungal activity and used in tumors, bleeding piles, ulcers (Tambekar and Khante, 2010; Singh, 2011; Patil *et al.*, 2006). Secondary metabolites are the important source with a variety of structural arrangements and properties (Pavitra and Vadivukarasi, 2012). In the last few years, gas chromatography mass spectrometry (GC-MS) has become firmly established as a key technological platform for secondary metabolite

profiling in both plant and non-plant species (Gani, 2003; Fernie *et al*, 2004; Kell *et al*., 2005). Volatile compounds are identified by the GC-MS analysis (Hassanpouraghdam, 2009). GC-MS is the best technique to identify the bioactive constituents of long chain hydrocarbons, alcohols, acids, esters, alkaloids, steroids, amino and nitro compounds etc. (Vinodh *et al*., 2013).

Present study comprises the bioactive compound identification of Bark extract of Butea monosperma.

MATERIAL AND METHOD

Collection of Plant Material

The bark of *Butea monosperma* was collected from the Kulhi Jungle at Panchyat Kuchu of Block Ormanjhi in Ranchi District of Jharkhand.

Preparation of extract

The barks were dried in a dark place at room temperature and processed for fine powder mixture-grinder followed by sieving and stored in an air tight container. Then, the fine powder of barks was subjected to methanol as organic solvent. The extract was collected using the soxhlet apparatus.

GC-MS analysis

1.5 ml of extract in a GC vial was subjected to the GC-MS equipment. The biomolecules investigation of organic extract was performed by GC-MS equipment (GCMS-QP2010 Ultra) followed by Gas Chromatography through Column Oven Temp. :100.0 °C, Injection Temp. : 260.00 °C, Injection Mode :Split, Flow Control Mode :Linear Velocity, Pressure :90.5 kPa, Total Flow :16.3 mL/min, Column Flow :1.21 mL/ min, Linear Velocity :40.9 cm/sec, Purge Flow :3.0 mL/ min, Split Ratio :10.0, Gas : Helium(He) and Mass Spectroscopy through Start Time :4.00min, End Time : 39.98 min, ACQ Mode :Scan, Event Time :0.20sec,Scan Speed :3333, Start m/z : 40.00 and End m/z :650.00. A mass spectrum observed.

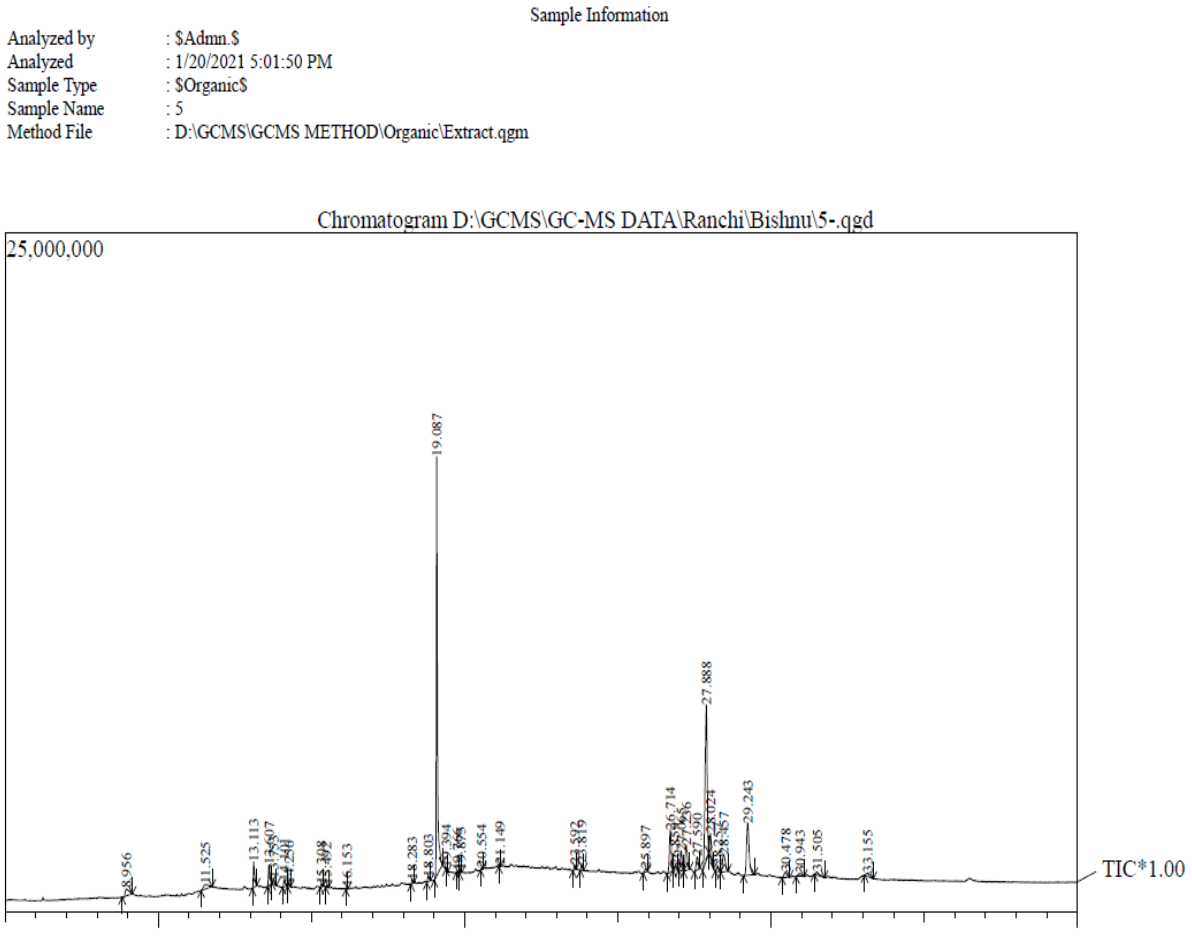


Figure 1: Chromatogram of GC-MS analysis of Bark Extract of *Butea monosperma*

RESULTS AND DISCUSSION

Interpretation of mass spectrum was done using database of NIST and WILEY Library. The mass spectrum of unknown compound was compared with the spectrum of known compound stored in the NIST'S and WILEY's Library. Compounds were identified by with authentic standards and by with recorded from computerized libraries.

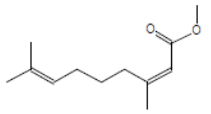
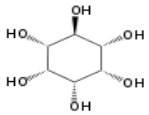
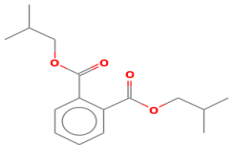
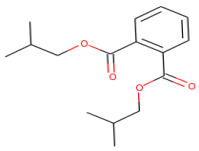
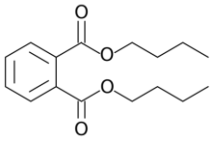
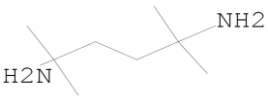
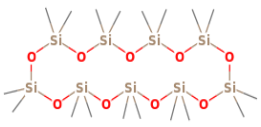
Table 1: Peaks with Retention time against Area in GC-MS analysis of Bark Extract of *Butea monosperma*.

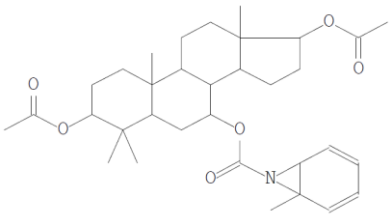
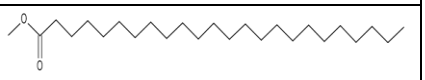
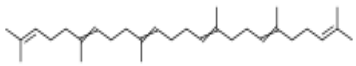
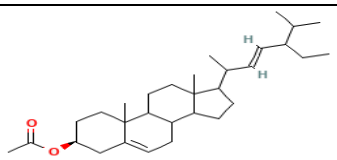
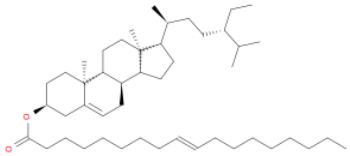
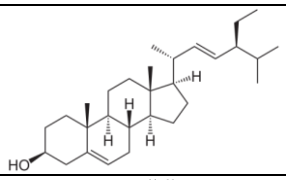
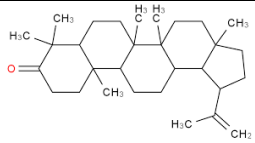
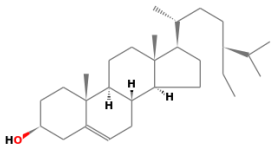
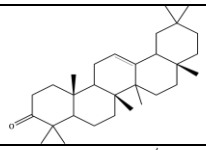
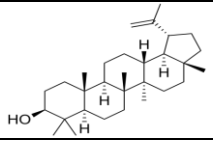
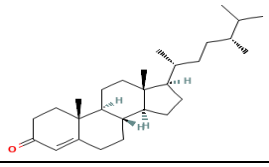
Peak Report TIC

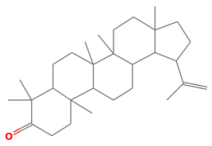
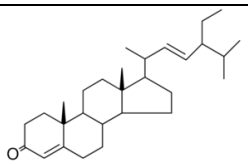
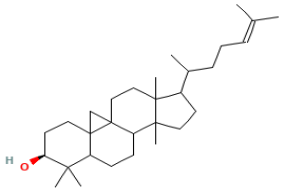
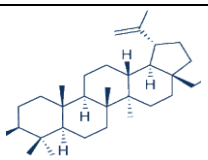
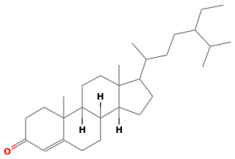
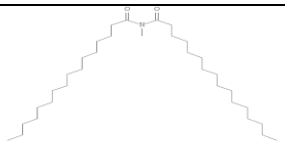
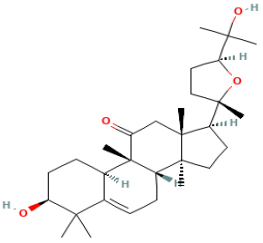
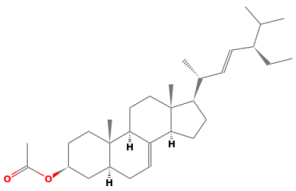
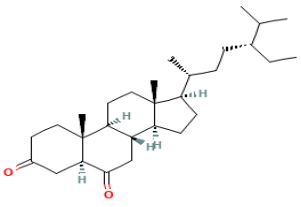
Peak#	R.Time	Area	Area%	Name
1	8.956	939073	1.67	2,7-Nonadienoic acid, 3,8-dimethyl-, methyl ester, (Z)-
2	11.525	869572	1.55	MOME INOSITOL
3	13.113	1341580	2.39	1,2-Benzenedicarboxylic acid, bis(2-methylpropyl) ester
4	13.607	1239423	2.21	1,2-Benzenedicarboxylic acid, bis(2-methylpropyl) ester
5	13.753	331055	0.59	1,2-Benzenedicarboxylic acid, bis(2-methylpropyl) ester
6	14.101	387728	0.69	Dibutyl phthalate
7	14.256	128822	0.23	1,2-BENZENEDICARBOXYLIC ACID, BIS(2-METHOX
8	15.308	119033	0.21	TETRADECANE, 1-CHLORO-
9	15.492	114419	0.20	2,5-Hexanediamine, 2,5-dimethyl-
10	16.153	43221	0.08	Cyclononasiloxane, octadecamethyl-
11	18.283	177843	0.32	Eicosanal-
12	18.803	333973	0.60	1-Heptacosanol
13	19.087	17868876	31.86	BIS(2-ETHYLHEXYL) PHTHALATE
14	19.394	50996	0.09	1H-PURIN-6-AMINE, [(2-FLUOROPHENYL)METHYL]
15	19.766	79125	0.14	1-Methyl-7-azabicyclo[4.1.0]hepta-2,4-diene-7-carboxylic a
16	19.875	87933	0.16	Hexacosanal
17	20.554	67201	0.12	Tetracosanoic acid, methyl ester
18	21.149	57845	0.10	2,6,10,14,18,22-TETRACOSAHEXAENE, 2,6,10,15,19,23
19	23.592	231660	0.41	Stigmasta-5,22-dien-3-ol, acetate, (3.beta.)-
20	23.819	310385	0.55	STIGMAST-5-EN-3-OL, OLEAT
21	25.897	265690	0.47	Stigmasterol
22	26.714	3000264	5.35	Lup-20(29)-en-3-one
23	26.859	298391	0.53	.gamma.-Sitosterol
24	27.065	1312884	2.34	.beta.-Amyrone
25	27.236	2061807	3.68	Lupeol
26	27.590	1040289	1.86	4-Campestene-3-one
27	27.888	12590340	22.45	Lup-20(29)-en-3-one
28	28.024	1506994	2.69	4,22-Stigmastadiene-3-one
29	28.257	362926	0.65	9,19-Cyclolanost-24-en-3-ol, (3.beta.)-
30	28.457	1832999	3.27	METHYL COMMATE B
31	29.243	5148253	9.18	.gamma.-Sitostenone
32	30.478	593401	1.06	hexadecanamide, N-methyl-N-(1-oxohexadecyl)-
33	30.943	402936	0.72	17-[5-(1-HYDROXY-1-METHYL-ETHYL)-2-METHYL-T
34	31.505	383427	0.68	Stigmasta-7,22-dien-3-ol, acetate, (3.beta.,5.alpha.,22E)-
35	33.155	499603	0.89	Stigmastane-3,6-dione, (5.alpha.)-
		56079967	100.00	

Mention in the Figure 2 confirms the compounds present in the organic extract. There were 14 peaks observed out of 35 peaks those were greater than 1% in area also mentioned in the Table 1 that comprises Name of the Compound, Molecular Formula, Molecular weight, Peak area (%) and Molecular structure. Peak 19.087 expressed the highest area percent that is 31.86 among them and identified as bis (2-ethylhexyl) phthalate. Bis (2-ethylhexyl) phthalate is a phthalate ester that is the bis(2-ethylhexyl) ester. It has a role as an apoptosis inhibitor, an androstane receptor agonist (PUBCHEM). Lup-20(29)-en-3-one was the second most abundant compound in the organic extract of Bark of Butea monosperma which was found to express the antiHIV properties and anti bacterial activities as well (Callies *et al*., 2015, Madureira *et al*., 2003; François *et al*., 2020).

Table 2: Name of the Compound, Molecular Formula, Molecular weight, Peak area(%) and Molecular structure expressed in Bark's extract of *Butea monosperma*.

Sl. No.	Name of the Compound	Molecular Formula	Molecular Weight	Peak Area %	Molecular Structure
1	2,7-Nonadienoic acid, 3,8-dimethyl-, methyl ester, (Z)-	$C_{12}H_{20}O_2$	**196**	**2.49**	
2	MOME INOSITOL	$C_7H_{14}O_6$	**194**	**2.31**	
3	1,2-Benzenedicarboxylic acid, bis(2-methylpropyl) ester	$C_{16}H_{22}O_4$	**278**	**3.56**	
4	1,2-Benzenedicarboxylic acid, bis(2-methylpropyl) ester	$C_{16}H_{22}O_4$	**278**	**3.29**	
5	Dibutyl phthalate	$C_{16}H_{22}O_4$	**278**	**1.03**	
6	TETRADECANE, 1-CHLORO	$C_{14}H_{29}Cl$	**232**	**0.32**	
7	2,5-Hexanediamine, 2,5-dimethyl-	$C_8H_{20}N_2$	**144**	**0.30**	
8	Cyclononasiloxane, octadecamethyl-	$C_{18}H_{54}O_9Si_9$	**666**	**0.11**	
9	Eicosanal-	$C_{20}H_{40}O$	**296**	**0.47**	
10	1-Heptacosanol	$C_{27}H_{56}O$	**396**	**0.89**	

11	1-Methyl-7-azabicyclo[4.1.0]hepta-2,4-diene-7-carboxylic acid, 3,17-diacetoxy-4,4,10,13-tetramethylhexadecahydrocyclopenta[a]phenan threne	$C_{33}H_{47}NO_6$	**553**	**0.21**	
12	Hexacosanal	$C_{26}H_{52}O$	**380**	**0.23**	
13	Tetracosanoic acid, methyl ester	$C_{25}H_{50}O_2$	**382**	**0.18**	
14	2,6,10,14,18,22-TETRACOSAHEXAENE, 2,6,10,15,19,23-EXAMETHYL	$C_{30}H_{50}$	**410**	**0.15**	
15	Stigmasta-5,22-dien-3-ol, acetate, (3.beta.)-	$C_{31}H_{50}O_2$	**454**	**0.61**	
16	STIGMAST-5-EN-3-OL, OLEAT	$C_{47}H_{82}O_2$	**678**	**0.82**	
17	Stigmasterol	$C_{29}H_{48}O$	**412**	**0.70**	
18	Lup-20(29)-en-3-one	$C_{30}H_{48}O$	**424**	**7.96**	
19	.gamma.-Sitosterol	$C_{29}H_{50}O$	**414**	**0.79**	
20	.beta.-Amyrone	$C_{30}H_{48}O$	**424**	**3.48**	
21	Lupeol	$C_{30}H_{50}O$	**426**	**5.47**	
22	4-Campestene-3-one	$C_{28}H_{46}O$	**398**	**2.76**	

23	Lup-20(29)-en-3-one	$C_{30}H_{48}O$	**424**	**33.40**	
24	4,22-Stigmastadiene-3-one	$C_{29}H_{46}O$	**410**	**4.00**	
25	9,19-Cyclolanost-24-en-3-ol, (3.beta.)-	$C_{30}H_{50}O$	**426**	**0.96**	
26	METHYL COMMATE B	$C_{31}H_{50}O_3$	**470**	**4.86**	
27	.gamma.-Sitostenone	$C_{29}H_{48}O$	**412**	**13.66**	
28	hexadecanamide, N-methyl-N-(1-oxohexadecyl)-	$C_{33}H_{65}NO_2$	**507**	**1.57**	
29	17-[5-(1-HYDROXY-1-METHYL-ETHYL)-2-METHYL-TETRAHYDRO-FURAN-2-YL]-4,4,10,13,14-PENTAMETHYL-2,3,4,5,6,7,8,10,12,13,14,15,16,17-TETRADECAHYDRO-1H-CYCLOPENTA[A]PHENANTHRENE-3,6,16-TRIOL	$C_{30}H_{50}O_5$	**490**	**1.07**	
30	Stigmasta-7,22-dien-3-ol, acetate, (3.beta.,5.alpha.,22E)-	$C_{31}H_{50}O_2$	**454**	**1.02**	
31	Stigmastane-3,6-dione, (5.alpha.)-	$C_{29}H_{48}O_2$	**428**	**1.33**	

CONCLUSION:

Presence of Mome inositol, Lupeol and Lupen-3-one in barks of Butea monosperma makes reliable to proceed further for pharmacology to design drugs.

Acknowledgement

This study was supported by Dr. Ajai Kumar, Faculty of Advanced Instrumentation Research Facility, Jawaharlal Nehru University, New Delhi-110067, India

Conflicts of Interest: The authors declare no conflict of interest.

REFERENCES

Callies O, Bedoya LM, Beltrán M, Muñoz A, Calderón PO, Osorio AA, Jiménez AI, Alcamí J, Bazzocchi IL (2015). Isolation, Structural Modification, and HIV Inhibition of Pentacyclic Lupane-Type Triterpenoids from Cassine xylocarpa and Maytenus cuzcoina. *Journal of Natural Products*, 78(5):1045-1055.

Farid MM, Hussein SR, Ibrahim LF, Desouky MA, Elsayed AM, Oqlah AA (2015). Cytotoxic activity and phytochemical analysis of Arum palaestinum Boiss. *Asian Pac J Trop Biomed* , 5(11):944-7.

Fernie AR, Trethewey RN, Krotzky AJ, Willmitzer L (2004). Metabolite profiling: From diagnostics to systems biology. *Nat Rev Mol Cell Biol*, 5:763–9.

François Nimbeshaho, Charity Ngina Mwangi, Fred Orina, Meryl Chacha, Nicholas Adipo, Jones O. Moody and Elizabeth M. Kigondu (2020). Antimycobacterial activities, cytotoxicity and phytochemical screening of extracts for three medicinal plants growing in Kenya. *Journal of Medicinal Plant Research*, 14(4), pp. 129-143.

Gani A (2003). Chemical Constituents and Uses, Medicinal plants of Bangladesh. *Asiatic Society of Bangladesh*, pp. 1-16.

Guo F, Feng L, Huang C, Ding H, Zhang X, Wang Z (2013). Phenylflavone derivatives from Broussonetia papyrifera inhibit the growth of breast cancer cells in vitro and in vivo. *Phytochem Lett,* 6(3): 331-6.

Hassanpouraghdam MB (2009). Flower head volatile oil composition of soilless culture grown Chrysanthemum balsamitta L. *Natural Products Research*, 23:672-677.

Kell DB, Brown M, Davey HM, Dunn WB, Spasic I, Oliver SG (2005). Metabolic foot printing and systems biology: The medium is the message. *Nat Rev Microbiol*., 3:557–565.

Madureira AM, Ascenso JR, Valdeira L, Duarte A, Frade JP, Freitas G, Ferreira MJU (2003). Evaluation of the Antiviral and Antimicrobial Activities of Triterpenes Isolated from Euphorbia segetalis. *Natural Product Research* 17(5):375-380.

Nair R, Vaghasiya Y, Chanda S (2007). Antibacterial potency of selected Indian medicinal plants. *International Journal of Green Pharmacy,* 1: 37-44.

Patil DA., Pawar S., Patil MV (2006). Ethnobotany of *Butea monosperma* (Lam.) in North Maharashtra, India. *Natural Product Radiance*; 5(4):323-325.

Patil MV, Pawar S, Patil DA (2006). Ethnobotany of *Butea monosperma* (Lam.) Kuntze in North Maharashtra, India. *Journal Natural Product Radmedis*, 5(4):323-325.

PavitraKand Vadivukarasi S (2012). GC-MS evaluation of chemical constituents from methanolic leaf extract of Kedrostisfoetidissima(Jac). Cogn. *Asian journal of pharmaceutical and clinical*, 5: 668-679.

Singh V (2011). Therapeutic significance of Butea monosperma: a review. *Journal of Drug Delivery and Therapeutics*, 1: 63–67.

Tambekar DH., Khante BS (2010). Antibacterial properties of traditionally used medicinal plants for enteric infections by adivasi's (Bhumka) in Melghat forest (Amravati district) *International Journal of Pharmaceutical Sciences and Research*, 1: 120–128.

Vinodh KS, Natarajan A, Devi K, Senthil kumar B (2013). Chemical composition of aqueous leaf extract of Murraya Koenigii. *Int J Pharm Biol Archiv.*, 4:493–7.

https://pubchem.ncbi.nlm.nih.gov/compound/Bis_2-ethylhexyl_-phthalate