DETERMINATION OF CHEMICAL COMPOSITION OF THE ESSENTIAL OIL OF THE FRESH LEAVES *Polyalthia longifolia*

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ABSTRACT

Inability of human being to have access to a conventional medical facilities has been a major world problem. Herbal medicine has become alternatives to conventional because the sources are natural, cheap and readily available. *Polyalthia* longifolia is an herbal plant which is used to treat gonorrhea, fever, ulcer, hypertension and rheumatism. This work aims at determining the chemical composition of the essential oil of the fresh leaves of *Polyalthia longifolia*. Its leaves were obtained from the Department of Plant Sciences, Olabisi Onabanjo University, Ago-iwoye. The leaves were identified and authenticated at herbarium Department of Botany, University of Ibadan. Essential oil of the leaves was obtained by hydro distillation using glass Clevenger apparatus. Quantitative and qualitative analysis of fresh leaves essential oil was done using Gas chromatography (GC) and Gas chromatography-mass spectrometry (GC-MS). Thirty seven different compounds were identified. Major compounds present are: 2-methyltetracosane , 7.95%, longifolene , 7.88%, Naphthalene,1,2,3,4a,5,8a-octahydro-4a, ;p 7.47% of the compounds identified. Minor compounds are Dodecane, 3.98%, cyclohexasiloxane, 3.43%, undecane 3,7-dimethyl ,3.43% and citral , 2.78% of the total compound extraction . Alloaromadendren occur in trace, 1.25%. The results showed that the essential oil of *Polyalthia longifolia* contained different class of organic compounds.

Keywords: *Polyathia longifolia,* essential oil clevenger apparatus and gas chromatography

INTRODUCTION

Natural products have been used as medicine since times immemorial. Majority of people in African and other developing countries of the world depend on herbs for their primary health care (Warri e*t al*., 2004). Herbs contained bioactive substances that can be used to treat chronic and infectious ailments (Harborne, 2005). Some herbs like *Solanum melogena*, *Rauvolfia vomitoria* and *Polylathia longifolia* are readily available in our environment which can be easily obtained at no cost. *Polyalthia longifolia* is a tropical and subtropical plant which can grow up to 1500 m with slender branches of length1- 2 m (Patwardhan *et al*., 2004). *It* belongs to the family Annonaceae.. *Its* parts can be used for the treatment of diseases such as, fever, diabetes, hypertension and hementhiasis (Marthanda *et al*., 2005). Some literatures had reported that Polyalthia longifolia contained sesquiterpenoids in the essential oil of itse leaf (Ogunbinu *et al*.,2007). The combination of clerodane diterpenoids in polyalthia had made it important as antimicrobial agent (Murthy *et al*., 2005). A lot of works have been done on *Polyatha longifolia* but few or no data has been reported of the chemical composition of essential oil obtained by hydrodistillation of *Polyathia lonifolia* leaves collected in Ago-Iwoye, Nigeria.

MATERIALS AND METHODS

Plant collection: Fresh leaves of *Polyathia longifolia* were collected from Department of Plant Sciences, Faculty of Science, Olabisi Onabanjo University, Ago-Iwoye,Ogun State Nigeria. The

Plant was identified and authenticated by Mr Donatus, E.S. of the herbarium, Department of Botany and Microbiology, University of Ibadan, Ibadan.

Isolation of the essential oils: Fresh leaves of *Polyalthia longifiola* were extracted with hdrodistillation using Clevenger apparatus with small quantity of n-hexane as the solvent.1000g of fresh *Polyalthia longifiola* leaves were weighed with balance and cut into smaller pieces loaded into 5000mL round bottom flask. Water was added, the set up was left for four hours. This experiment was repeated three times before reasonable quantity of oils were obtained.

Gas chromatography (GC)

The essential oil was subjected to GC analysis on Agilent technology 7890model with splitter mode and HP-5973 at 70Ev. Helium was used as a carrier gas at a flow rate of 1ml/min. The GV over temperature was programmed at 60°C (held for 0 min), heated to 140°C at 3 °C/min

with a final hold time of 10mins at 280°C injector and detector temperature were fixed at 200°C and 250°C respectively.

Gas chromatography-mass spectroscopy (GC-MS)

The GC-MS analysis were performed on an Agilant technology with splities injected interfaced to a 5973 and 7683 mass selective detector operated at 70Ev with a mass ray of m/z 40-450. The oven temperature was programmed from 60-250°C (hold for 5minutes) at a rate of 3°C/min. The same operation and temperature programming was used to calculate the relative percentage amount of the separated compounds.

Identification of compounds

Identification of essential oil components was based on their retention indices (determined with reference to a homologous series of n-alkanes and by comparison of their mass spectral fragmentation patterns in computer matching against inbuilt data (NIST data base/chemstation data system) with data previously reported in the literature (Libby, 1991) and the use of pherobase to calculate the Kovat index.

RESULTS AND DISCUSSION

Table 1showed the results of GC-MS analysis of the essential oils of *Polyathia longifolia* identified thirty seven different compounds, making 98.99% of the total analysis. Major compounds present are: 2-methyltetracosane, 7.95%, longifolene, 7.88%, Naphthalene,1,2,3,4a,5,8a-octahydro-4a,8-dimethyl 2- (1-methyleneyl)-[2R-(2; alpha.,4a.alpha.,8a.beta)] ,7.47% of the compounds identified. Minor compounds are Dodecane , 3.98%, cyclohexasiloxane , 3.43%, undecane 3,7-dimethyl ,3.43% and citral , 2.78% of the total compound extraction . Alloaromadendren occur in trace, 1.25%. 2-methyltetracosane an hydrocarbon is used in pharmaceutical and coating industries,and are found in other plants. Longifolene, a sesquiterpenoids are used in consumable goods and other chemical production while dodecane,an hydrocarbon are used as common solvent, chase and scintillator in industries. Dodecane, undecane 3,7 dimethyl,citral and cyclohexasiloxane are present in small amount, they are a mixture of hydrocarbon and monoterpenoids. Some of these compounds are used as solvent, chaser and scintillator components in industries. Alloaromadendrene occurs in trace amount, although it is found as one of the major constituents of *Eucalptus microltheca* leaf oil from semnan province (Hahemi-Moghaddam *et al*., 2013) and in *Eucalptus sergentii* (aromadendrene) from Isfahan province (Safaei and Batooli, 2010). The extract of alloaromadrendene is used in treating skin irritation, acne and pruritus. Naphthalene, 1, 2, 3, 4a, cis-alpha-bisabolene, a sesquiterpenoids are used as flavouring agent in confectionery and as a fixative in perfume. Eicosane , an hydrocarbon is used in candle and paraffin wax for the storage of solar energy.It is also used in plastic, cosmetic and petrochemical industries.

CONCLUSION

It could be concluded from this study that essential oil obtained from *polyathia longifolia* is a good source of essential chemical constituents that could responsible for medicinal properties exhibited by the plant to cure many diseases that affect human beings

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Table1: Chemical composition of essential oils the fresh leaves of *Polyathia longifolia*

Compound No.	Retention Min.	Identified Compound	% Composition	Chemical Formula	MS[ab]	RI Calculated
1	5.292	Cyclopentasiloxane decamethyl-Hexane	2.20	$C_{10}H_{30}O_5Si_5$		
2	6.537	1-chloro-5-methyl	1.35	$C_7H_{15}Cl$	91[a],14,27,43,49,55,58,63,69,77,83[b]	1000
3	6.942	Citral	2.76	$C_{10}H_{16}O$	41[a],29,53,59,84,94,109,123,137,152[b]	1168
4	7.056	Undecane 3,7-dimethyl	3.40	$C_{13}H_{28}$	43[a],21,29,57,71,85,99,113,127,155[b]	1031
5	7.689	Cyclohexasiloxane	3.40	$C_{12}H_{30}O_5Si_6$		1260
6	8.649	Undecane 3-methyl-	0.99	$C_{12}H_{26}$	57[a],15,29,43,71,77,85,99,112,126,141[b]	1419
7	9.007	Bicyclo[5.20]nonane 2-methylene	1.64	$C_{15}H_{24}$	93[a],27,41,55,69,79,107,120,133,147,175[b]	1322
8	9.531	Alloaromadadendrene	1.24	$C_{15}H_{24}$	161[a],29,41,55,69,79,91,105,119,133,147,175,189,204[b]	1674
9	9.910	3-Isopropoxy-1,1,1,7,7,7-hexamethyl 1-3,5,5-tris(trimethylsiloxy)tetra siloxane	5.48	$C_{18}H_{52}O_7Si_7$	NA	1500
10	10.278	(3R,3ar,7R,8as)-3,8,8,8-Tri-methyl-6-1H-3a,7-methanoazulene	1.67	$C_{15}H_{24}$	NA	1361
11	10.413	Dodecane	3.94	$C_{12}H_{26}$	57[a],15,29,43,71,70,77,91,112,127,141[b]	1500
12	10.891	Longifolene	7.80	$C_{15}H_{24}$	161[a],29,39,55,67,79,94,107,119,133,147,161,175,189,204[b]	1201
13	11.000	Cyclohexane,1-ethnyl-1-2,4-bis(1-methylethenyl)-,Cis-[1.alpha.,2.beta.,4.beta]	2.44	$C_{15}H_{24}$	81[a],29,41,55,68,93,107,121,133,147,161,175,189,204[b]	1550
14	11.108	Hexadecane	3.17	$C_{16}H_{34}$	57[a],29,43,71,85,99,113,127,141,155,169,183,197[b]	1500
15	11.342	beta-longipinene	3.57	$C_{15}H_{24}$		1500
16	11.451	Cyclohexane, 1-ethenyl-1-methyl1-2,4-bis(1-methylethenyl)-	2.44	$C_{15}H_{24}$	NA	1500

17	11.539	Cis-alpha-Bisabolene	2.68	$C_{15}H_{24}$	93[a],27,41,53,67,79,105,121,133,147,161,175,189,204[b]	1500
18	11.612	Cis-alpha.-Bisabolene epoxide	4.18	$C_{15}H_{24}O$	43[a],55,67,81,93,109,121,133,151,159,176,187,202,220[b]	1500
19	11.876	Naphthalene, 1,2,3,4a,5,8a-octahydro-4a,8-dimethyl-2-C(1-methylethenyl)-,[2R-(2.alpha.,4a.alpha.,8a.beta.,)]	7.40	$C_{15}H_{24}$	NA	1127
20	12.037	Bicyclo[6.1.0] non-1-ene	2.32	C_9H_{14}	NA	1500
21	12.188	Tricyclo[5.4.0.0(2,8)] undec-9-ene)2,6,6,9-tetramethyl-(1R,2S,7R,8R)-	2.91	$C_{15}H_2$	NA	1271
22	12.281	6-methyl-2-(4-methylcyclohex-3-en-1-yOhepta-1,S-diene-4-ol	0.92	$C_{15}H_{24}O$	119[a],41,51, 43,81, 91,216[b]	
23	12.364	Dotriacontane,1-iodo	2.09	$C_{32}H_6Si$	57[a],71,85,418[b]	
24	12.831	2-Methyltetracosane	7.87	$C_{25}H_{52}$	57[a],43,71, 352[b]	
25	13.246	5-octadecene,(E)-	0.64	$C_{18}H_{36}$	55[a],29,43,69,83,97,111,125,139,153,154,167,168,181,182,195,196,224,250[b]	
26	13.620	Cyclononasiloxane,Octadecamethyl	0.60	$C_{18}H_{54}O_9Si_9$	73[a],147,22,281,355,401,429,475,515,563[b]	
27	13.973	Hexadecane,1-Chloro-	1.10	$C_{16}H_{33}Cl$	57[a],24,43,71,85,91,105,114,133,147,161,175,189,203,224,260[b]	
28	14.600	2-methyloctasane	3.64	$C_{29}H_{60}$	57[a],43,71,84[b]	
29	15.166	Heptasiloxane,1,1,3,3,5,5,7,7,9,9,11,11,13,13,-tetradecamethyl	0.83	$C_{14}H_{42}O_6Si_7$	73[a],207,355,215[b]	1840
30	15.270	Cycloeicosane	0.88	$C_{20}H_{40}$	55[a],29,43,69,83,97,109,111,125,139, 280[b]	1788
31	15.327	Eicosane	2.49	$C_{20}H_{42}$	57[a],29,43,71,85,99,113,127,141,155,169,183,197,211,225,23, 9, 253[b]	2000

32	15.488	trans-Geranylgeranoil	2.06	$C_{20}H_{34}O$	69[a],29,41,55,81,93,107,121,136,147,161,177,189,203,204,221,224,227,228,235[b]	1873
33	15.960	IH-3a,7,Methanoazulene,octahydro-1,4,9,9-tetramethyl-	1.88	$\mathbf{C}_{15}H_{26}$	41[a],29,55,67,79,91,107,121,135,149,163,177,191[b]	2207
34	17.1689	Disulfide, di-tetra-dodecyl	1.20	$C_{24}H_{50}S_2$	57[a],43,71, 402[b]	2090
35	17.169	Carbonic acid, Prop-1-en-2-yl tetradecylesther	1.98	$C_{19}H_{36}O_3$	57[a],43,71[b]	2296
36	18.969	Cyclododecane	0.87	$C_{12}H_{24}$	55[a],15,29,41,69,83,97,111,125,140,153,168[b]	1702
37	20.837	Mono(2-ethylhexyl)phthalate	4.13	$C_{16}H_{21}O_4$	149[a],29,41,50,55,57,65,70,76,83,93,97,105,112,122,132,167,179[b]	

Key: RT-Retention time in minute, RI-Kovat values from the literature, NA-Kovat values from literature not available, MS[ab] a=base peak, b=Molecular ion peak