Asian Journal of Pharmaceutical and Health Sciences
www.ajphs.com

Monoterpenes rich essential oils from the leaves of *Polyalthia korintii* (DUNAL) BENTH. & HOOK.F. (Annonaceae) from Kerala

Abdul Rasheed Sherin*[a], Asla. K. Kukku[b], N. K. Leela[c]

1 Department of Pharmaceutical Chemistry, Jamia Salafiya Pharmacy College, Pulikkal, Malappuram, Kerala, India.
2 Department of Phytochemistry and Pharmacognosy, Jamia Salafiya Pharmacy College, Pulikkal, Malappuram, Kerala, India.
3 Department of Crop Production and Post Harvest Technology, IISR Calicut, Kerala, India.

ARTICLE HISTORY

Received: 14.10.2018

Accepted: 20.12.2018

Available online: 31.12.2018

Keywords:

Polyalthia korintii, GC-MS, GC-FID, Polymyxin B, *α*-pinene, *β*-pinene

***Corresponding author:**

Email : sherinabdul@gmail.com
Phone : +91-9746719345

ABSTRACT

Essential oils have been isolated from different species of Polyalthia. This is the first report on the chemical composition of essential oil isolated from the leaves of *P.korintii*. The essential oil has been isolated by hydrodistillation method and chemical composition of the oil was determined by GC-MS and GC-FID techniques. Compounds were identified by calculating the relative retention indices, comparing the mass spectrum with the library (NIST&WILEY) and comparing with literature data. Concentration of components present in the oil was determined by matching peaks of GC-FID with that of GC-MS and area normalization technique. The essential oil was found to be rich in monoterpenoids (74.22%) which found in low concentration in the leaves of other species. The major compounds identified in the leaf oil were *α pinene* (43.18%), *β-pinene*(25.51%), *myrcene* (2.72%), *β-elemene*(3.98), *β-caryophyllene*(3.36%), *α-humulene*(2.10%) and *caryophyllene oxide*(4.08%). The isolated essential oil (10µl) subjected to antimicrobial sensitivity test by disc diffusion method *Staphylococcus aureus* ATCC25923, *E. coli* ATCC25922 and in a clinical strain (*Klebsiella pneumonia*) against *Polymyxin B* (10µg) as standard. Essential failed to show antimicrobial activity.

INTRODUCTION

Genus Polyalthia is one of the largest Genera (more than 70 species) in the family Annonaceae, widely distributed in India, Bangladesh, Australia, South Africa, Vietnam and China [2]. Genus Polyalthia is rich in terpenoids. Essential oils have been isolated from different parts of *P. suaveolens, P. australis, P.michealii*, two chemotypes of *P. nitidissimia, Polyalthia sp*. (Wyveri BP Hyland BFK), *P. longifolia*, *P. longifolia.var. pendula*, *P. harmandii*, *P.jucunda*, *P.thorelii*, *P.sessiliflora* and *P.oliveri* [3-12]. Essential oils isolated from the leaves of *P.suaveolens*, *P.nitidissima*, *P.longifolia*, *P. harmandii*, *P.jucunda*, *P.thorelii*, *P.longifolia*, *P. longifolia.var. pendula*, *P.sessiliflora* and *P.oliveri* are rich in sesquiterpenoids [3-12]. Higher concentration of Oxygenated sesquiterpenoids was present in the leaf oils of *P. Australis*, *P.michealii* and *Polyalthia sp*. (Wyveri BP Hyland BFK). Leaf oil from Australian species was containing *spathulenol* as major constituents whereas *Polyalthia sp*. (Wyveri BP Hyland BFK) contain *globulol* as major component[5]. Leaf oil of *P.suaveolens* contains *β-caryophyllene* (32.8%) and *α-humulene* (34.2%) whereas essential oil from the fruit of *P.suaveolens* is rich in monoterpenoids[3]. Stem bark oil of *P.jucunda* and *P.sessiliflora* were containing almost equal quantities of mono terpenoids and sesquiterpenoids[10]. *Polyalthia longifolia var.pendula* from collected two different regions of Vietnam shows a different chemical profile in their leaf essential oil composition. Plant collected from the Nghean province contain *δ-cadinene* (24.55), *zingiberene* (19.6%) and *aromadendrene* (19.1%) [7]. But the same collection from the Than Hoa Province contains *β-caryophyllene*(30.0%) followed by *zingiberene*(21.7%) and *aromadendrene* (15.2%) [8]. 45 leaf samples of *P.oliveri* were collected from Yappo Abbe, Petit Yapo and Adiopodume of Ivory Coast. All 45 samples were rich in sesquiterpenoids. This study was pointing out the chemotaxonomic relationship of *P.oliveri* with other species. 45 samples have an entirely different chemical

pattern in their essential oil content [12].

Polyalthia korintii is a small tree up to 5 m tall. Leaves are simple, alternate, distichous, glabrous with an entire margin. Flowers are solitary axillary. Seeds are ovoid berries seen in a cluster of 10 to 13. Oral administration of root powder decoction of this plant is used in the treatment of Russel viper bite [13].

MATERIALS AND METHODS

Collection of plant

Fresh leaves of *Polyalthia korintii* were collected from the Jamia Salafiya Pharmacy College Campus on the month of May 2016 and specimen (No. 88443a) was submitted to Department of Botany, University of Calicut, Malappuram, Kerala.

Isolation of Essential oil

About 400 Grams of freshly cut leaves were subjected to hydrodistillation using Cleavenger type apparatus for 4 hours. 0.8ml oil was obtained (0.20%). Oil was dehydrated with sodium sulphate and stored in the refrigerator (not in freezer) for further studies. Refractive index of the essential oil was determined by using Abbe refractometer at 26.6^{0}C.

GC-MS analysis of the essential oil.

GC-MS analysis of the essential oil was done on a Shimadzu GC-MS QP 2010, equipped with Rt X-5 column (30m× 0.25mm with a film thickness of 0.25µm) by applying the following analytical conditions. Injection volume- 1µl; carrier gas- Helium; flow rate- 1ml/min; injection port temperature-260^0 C; detector temperature-250^{0}C; ionization energy- 70eV; split ratio- 1:40. Temperature programming- at 60^0 C hold for 5 minutes; temperature was increased to 110^{0}C at a rate of 5^{0}C/min; up to 200^{0}C at a rate of 3^{0}C/min and up to 220^{0}C at a rate of 5^{0}C/ min. Finally at 220^{0}C hold for 5 min. Ionization voltage-70eV; mass range-60-400amu; split ratio-1:40. Relative retention indices (RRI) were calculated and compounds were identified by comparing the mass spectrum with the library (NIST&WILEY) and literature data [1].

GC- FID analysis of the essential oil

1µl of oil was injected into Shimadzu GC-2010 equipped with a flame ionization detector. Rt X-5 column (30m× 0.25mm) with a film thickness of 0.25µm was used. Temperature programming was the same as that of the GC-MS while nitrogen was used as the carrier gas. Percentage of components was found out by peak matching with GC-MS and area normalization.

Antimicrobial sensitivity test.

An antimicrobial sensitivity test was done by disc diffusion method using ATCC strains (*Staphylococcus aureus* ATCC25923 &*E. coli* (ATCC25922) and in a clinical strain (*Klebsiella pneumonia*) against Polymyxin B (10µg) as standard. 10µl of oil was used for the antimicrobial sensitivity test.

RESULTS

The yield of essential oil from the leaves was 0.2% (v/w). Refractive index of the oil was 1.3288 at 26.6^{0}C. By using GC-MS method 33 compounds with detectable concentration were separated (figure no:1) and 29 compounds were identified. The concentration of monoterpenes dominated with 74.22% in total of 98.12% of identified terpenoids. Sesquiterpenoids concentration limited to 18.34%. Concentrations of oxygenated monoterpenoids and oxygenated sesquiterpenoids are found to be 1.33% and 4.26% respectively. In monoterpenoids, *α-pinene* (43.18%), *β-pinene* (25.51%), *myrcene*(2.72%) and *sylvestrene*(1.21%) are present as lead compounds. In sesquiterpenoids, *cis-calamine* (4.08%), *β-elemene* (3.98%), *β-caryophyllene*(3.36%) and *α-humulene*(2.10%) are present (Table no.1). Essential oil shows no activity against ATCC strains *Staphylococcus aureus* (ATCC25923) &*E. coli* (ATCC25922) and in a clinically isolated strain (*Klebsiella pneumonia*).

DISCUSSIONS

Different species in Polyalthia were collected for essential oil studies from Gabon, Australia, Nigeria, Vietnam and Ivory Coast. Previously reported research papers shows that the essential oil isolated from the leaves of other species of Polyalthia irrespective

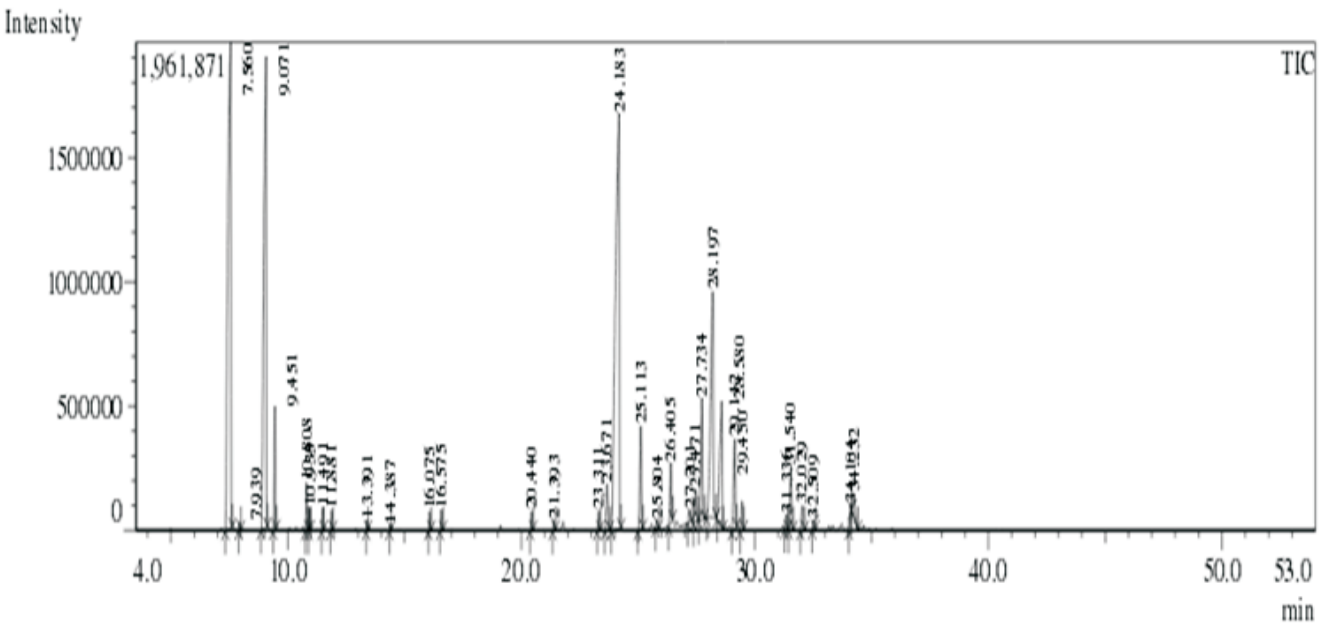

Fig. 1 : IGas chromatogram of *P.korintii* leaf oil

Sl. No	Chemical constituents	RI (calculated)	RI (literature)	Percentage
1	α –Pinene	940	932	43.18
2	Camphene	951	946	0.21
3	β-Pinene	983	974	25.51
4	Myrcene	993	988	2.72
5	Sylvestrene	1031	1025	1.21
6	1,8-Cineole	1035	1026	0.41
7	β-Ocimene	1050	1044	0.53
8	γ-Terpene	1061	1054	0.45
9	Linalol	1104	1095	0.24
10	Unidentified	1133	-	0.1
11	4-Terpinenol	1182	1174	0.54
12	γ-Terpineol	1197	1186	0.54
13	Unidentified	1304	-	0.49
14	Unidentified	1329	-	0.12
15	β –Copaene	1379	1374	0.63
16	β –Cubebene	1389	1387	0.12
17	β –Elemene	1402	1389	3.98
18	β –Caryophyllene	1426	1417	3.36
19	Amorpha-4,11-diene	1444	1449	0.25
20	α –Humulene	1459	1452	2.10
21	β –Chamigerne	1480	1476	0.20
22	Germacrene-D	1487	1484	0.41
23	Aristolochene	1493	1487	0.50
24	Bicyclogermacrene	1505	1500	0.89
25	Germacrene-A	1515	1508	0.84
26	*Cis*-Calamene	1530	1528	4.08
27	*Trans*-Cadina-1,4-diene	1538	1533	0.98

28	Unidentified	1587	-	0.61
29	Caryophyllene oxide	1592	1582	0.61
30	Guaiol	1605	1600	0.85
31	β –Eudesmol	1660	1649	0.27
32	Eudesmol	1663	1662	0.86
33	Unidentified	1618	-	0.56
Total				100.03
Identified				98.12
Monoterpene				74.22
Oxygenated monoterpenes				1.33
Sesquiterpenes				18.34
Oxygenated sesquiterpenes				4.26

of their geographical origin contain the high concentration of sesquiterpenoids except in two Australian species *P.australis* and *P.michaelii*. Later two species were rich in oxygenated sesquiterpenoids. It was found that essential oils of different species of Polyalthia show different chemical constituents. But in Australian species,*spathulenol* was the major constituent. This is the first research article on the chemical composition of essential oil isolated from the leaves of *P.korintii* available in Kerala. Leaf oils of other species of *Polyalthia* were rich in sesquiterpenoids but this particular species possess a high concentration of monoterpenoids. We have identified 29 compounds with the help of GC-MS and literature data out of 33 compounds. Even though essential oil is inactive against microorganism but it may show anti-inflammatory activity due to the high concentration of α-pinene and β-pinene [14].

CONCLUSION

This research work added one more plant to the group of essential oil bearing plants in the family of Annonaceae. *Polyalthia korintii* is a phytochemically least explored plant in the genus of Polyalthia. So this work will help the scientific community to do more studies in the phytochemistry and pharmacological properties of the plant in the near future.

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