Bulletin of Environment, Pharmacology and Life Sciences
Bull. Env. Pharmacol. Life Sci., Vol 11 [8] July 2022 : 15-21

Online ISSN 2277-1808
Journal's URL:http://www.bepls.com
CODEN: BEPLAD

ORIGINAL ARTICLE **OPEN ACCESS**

Elucidation of Secondary Metabolites From *Lindernia antipoda* (L.) Alston

Rajkumar P, Jahirhussain G* and Karuniya Raja Viella G
PG and Research Department of Botany, Government Arts College (Autonomous), Karur-5
Affiliated to Bharathidasan University, Tiruchirrappalli-29.
E. mail- jahirmaya@gmail.com

ABSTRACT
The aquatic ornamental and medicinal plant of the family Linderneaceae (Previously Scrophulariaceae) Lindernia antipoda (L.) Alston was subjected to preliminary and GC-MS phytochemical analysis to study about the chemical compounds present in the form of secondary metabolites in the leaf extract. The three solvents ethanol, ethyl acetate and petroleum ether were used to study and compare the preliminary analysis of the wild and in vitro cultured plant and the GC-MS analysis used ethanolic, ethyl acetate and methanolic leaf extract for the compound analysis. The preliminary test showed alkaloids, flavonoids, steroids, saponins in the ethanolic extract and some test showed presence of compounds in the in vivo sample and some in the in vitro sample. The GC-MS analysis gave 101 compounds from the extracted solvents. The investigation impart that the plant has high medicinal property and exploring with advanced technology can help in curing diseases.
KEYWORDS: *Phytochemical, GC-MS, leaf extract, Solvents*

Received 13.05.2022 Revised 26.06.2022 Accepted 29.07.2022

INTRODUCTION

Every country has its own traditional system which is also implemented in other countries practice with some modification. There are a wide range of literatures from pre-historic to the modern era to assist the healers in treatment. Indian *Materia Medica* provides over 3500 medicinal plants [1]. The Indian system of medicine comprising Ayurveda, Siddha, Unani, Amchi and local health traditions, made use of plants in crude form usually dried parts of stem, root, leaf, bark, flower, seed etc.,[2]. The efficacy of crude extract was not scientifically verified [3] in earlier. So there were misunderstanding of the quantity (dosage); sometimes it leads to death instead of cure. The raw materials not only applied in Indian system but also in Chinese, Japenese and Tibetian system of therapeutics. Asia has abundant medicinal and aromatic plant species due to climatic conditions. *Lindernia antipoda* is a small trailing plant with apogeotrophic stem having roots at nodal region belongs to the family linderneaceae. The leaves are entire, sessile and it is toothed at margins of the lamina. The plant species has been reported by fewer works, thus has gained much attention of us. The plant has therapeutic potential to help in overcoming cough, jaundice and the issues related to menstruation. Since the therapeutics of plant is mainly based on the chemo substances or secondary metabolites of the plant we tried to compare the compound elucidated from the *in vivo* and *in vitro* whole plants samples by GC-MS analysis of various solvent extracts. The study can help in drug discovery and eradicate ailments in human beings.

MATERIAL AND METHODS

Preliminary analysis of *Lindernia antipoda* (L.) Alston

TEST FOR FLAVONOIDS: Alkaline Reaction Test- To 1 ml of crude extract few drops of dil. NaOH was added. The formation of yellow colour indicates the presence of flavonoids.
Shinadow's Test- To alcoholic extract, the addition of a few magnesium turnings and 1-2 drops of conc. HCl and boiling for five minutes if it leads to the formation of red colour shows the presence of flavonoids.
TEST FOR ALKALOIDS: Dragendroff's Test- To 5 ml crude extract 2 ml conc. HCl was added. The addition of 1 ml dragendroff's reagent produces an orange or red precipitate to indicate the presence of alkaloids.
Hager's Test - The plant extract was added with few drops of a saturated solution of picric acid, yellow precipitate confirms the presence of alkaloids.

TEST FOR COUMARINS - The extract was treated with 1 ml of 10% alcoholic NaOH. The presence of coumarin is indicated by the formation of a yellow colour.
TEST FOR STEROIDS AND STEROLS- To 2 ml chloroform, a few drops of conc. H_2SO_4 added along the sides of the test tube. To it 5 ml of aqueous plant extract was added to obtain a red colour for the presence of steroids and sterols.
Liebermann - Burchard Test - A few drops of chloroform and 3 ml of glacial acetic acid to the extract, warmed and cooled. To that few drops of concentrated sulphuric acid were added along the sides of the test tube. The solution becomes red, then blue and finally turns bluish-green indicating the presence of steroids and sterols.
TEST FOR CARBOHYDRATES: Benedicts Test - To 2 ml Benedict's solution five drops of the extract were added and boiled for 5 minutes. Red, Yellow or Green precipitate confirms carbohydrates in the plant.
Fehlings test - A mixture of 1 ml of Fehling solution A and 1 ml of Fehling solution B were added in a test tube and to it few drops of extract was added and boiled. Yellow or brown precipitate indicates the presence of carbohydrate.
TEST FOR PROTEIN AND AMINO ACIDS: Ninhydrin Test - The extract is treated with 0.2% ninhydrin reagent. The development of purple colour reveals the presence of proteins, peptides or aminoacids.
Biurette test - 2 ml of 10% NaOH added to an equal amount of extract and a few drops of 0.1% $CuSO_4$. Persistence of violet or pink colour in the sample is a confirmation for protein and amino acid.
TEST FOR PHENOLS- A few drops of alcohol and ferric chloride solution were added to the extract. The appearance of a blue or green colour indicates the presence of phenols.
TEST FOR TANNINS: Gelatin Test - The extract is dissolved in a minimum amount of water and filtered. To the filtrate, a 1% solution of gelatin is added. Precipitation by gelatin in glass.
Braymer's test - A few drops of 5% ferric chloride and 2 ml $H_2SO_4$was added to 2 ml of plant extract. Green precipitation is the indication for tannins.
TEST FOR SAPONIN: Lather Test -1 ml of extract is diluted with 5 ml of distilled water and agitated. The formation of copious lather indicates the presence of saponins.
Froth's Test - Heat 5 ml of extract along with 5 ml of water. The formation of froth is the final point for the secondary metabolite presence.
TEST FOR GLYCOSIDES: The extract was mixed with a little amount of anthrone on a watch glass. One drop of concentrated sulphuric acid was added and made into a paste and warmed gently over a water bath. The presence of glycosides was indicated by dark coloration.
Borntrager's Test -Distilled water of 1 ml was added to 1 ml crude extract along with few drops of NaOH. The appearance of yellow colour shows glycosidic contents.
TES FOR FIXED OILS AND FATS (SPOT TEST)- A small quantity of extract is pressed separately between the filter paper. Formation of a grease spot indicates the presence of fixed oils and fats.
TEST FOR VOLATILE OILS (SPOT TEST)- A drop of extract is placed on Whatman's No. 1 filter paper. No trace of extract (complex evaporation) is the indication.

GC MS METHODOLOGY

The GC-MS analyses were conducted in a QP-2020 (Schimadzu, Kyoto, Japan). An aliquot (1µL) of extract was injected into the GC-MS on a 30 m capillary column, with a film thickness of 0.25 m (Length 30 m, id 0.25 mm, Phase SH-Rxi-5Sil MS) using the following temperature program: initial oven temperature 50 °C, then 6° C Rate /min to 250 °C and final hold at 280 °C for 2 min. Ion source temp: 200°C. The gas chromatography facility was equipped with ION source detector connected to an integrator. The area under each peak was used for qualification. The GC-MS was operated under Electron impact ionization at 70 eV, using Helium gas. Identification of unknown compounds was made by probability-based matching, using the computer library within the NIST 14, Wiley8 system. Total GC running time was 40 minutes.

RESULT AND DISCUSSION

The ethanolic, ethyl acetate and petroleum ether leaf extracts of both *in vivo* and *in vitro* plant has been investigated for the presence or absence of phytochemicals like flavonoids, alkaloids, carbohydrate and many more. The three solvents that were taken for phytochemical extraction were ethanol, ethyl acetate and petroleum ether. Both the *in vivo* and *in vitro* samples were tested for their phytoconstituents. The alkaline test for flavonoid , hager's test for alkaline showed the presence in both the samples and the samples also indicated the existence of coumarins, steroids and sterols, carbohydrate, phenol, saponin, glycoside and volatile oil while the other compounds were absent in the ethanolic leaf extract of *Lindernia antipoda.* The ethyl acetate extract recorded the presence of flavonoid, carbohydrate in the *in vivo* sample, phenol in the wild sample along with tannin, saponin and glycoside. Alkaloids, coumarins, steroids and sterols, protein (*in vitro*) sample phenol and saponin in the *in vitro* samples, fixed oils and volatile oils

that were absent in the ethyl acetate leaf extract. The petroleum ether extract of *Lindernia antipoda* changed its colour for Hager's test for alkaloid, coumarin, carbohydrate, biurette test for protein, gelatin test for tannin and lather, froth test for saponin while for other test and other compound the extract remained the same indicating absence of the secondary compounds in the extract. Of all the tested solvent extracts of leaf, ethanoic leaf extract of *Lindernia antipoda* gave more compounds than the other solvent extracts. So we concluded the major phytoconstituents in the plant can be elucidated using ethanol.

The GC-MS analysis of the ethanolic extract of *L. antipoda* has given a total of 28 compounds in all of these 11 compounds been present in wild sample while 25 compounds in the cultured plant. Glyceryl Tridocasahexaenoate was absent in both the samples whereas Ethanol, 2-(9, 12-Octadecadienyloxy)-, (Z, Z) and Squalene was absent only in cultured plant. The compounds include the groups like fatty acid, alkaloid, flavanoid, and sterol. After the 11th compound all other compounds were present only in the *in vitro* analysis. This shows that the accumulation of secondary metabolite is maximum and large when compared to the wild sample.

The ethyl acetate extract of sparrow lindernia had a total of 16 and 24 compounds available in the extract of *in vivo* and *in vitro* plant respectively. In total a sum of 37 compounds were observed from the peaks of the spectrometry. Here also the *in vitro* samples had the large number of compounds.

The methanolic leaf extract had 12 compounds from wild plant and 30 compounds were identified in the *in vitro* methanolic extract of *L. antipoda.* The total number of compounds identified from methanolic extract was 36.

Table no. 1: Phytochemical screening of *In vivo* and *In vitro* leaf extract of *Lindernia antipoda* (L.) Alston

S. NO	SECONDARY METABOLITE	NAME OF THE TEST	ETHANOL		ETHYL ACETATE		PETROLEUM ETHER	
			In vivo	*In vitro*	*In vivo*	*In vitro*	*In vivo*	*In vitro*
1	**FLAVONOID**	Alkaline reaction test	+	+	+	+	-	-
		Shinoda test	-	-	-	-	-	-
2	**ALKALOID**	Dragendroff's test	-	-	-	-	-	-
		Hager's test	+	+	-	-	+	+
3	**COUMARINS**	Alkaline test	+	+	-	-	+	+
4	**STEROIDS AND STEROLS**	Chloroform test	-	-	-	-	-	-
		Liebermann Burchard test	-	+	-	-	-	-
5	**CARBOHYDRATES**	Benedicts test	+	+	+	+	+	-
		Fehling's test	+	+	+	+	-	+
6	**PROTEIN AND AMINOACID**	Ninhydrin test	-	-	+	-	-	-
		Biurette test	-	-	+	-	+	-
7	**PHENOL**	Ferric chloride test	+	+	+	-	-	-
8	**TANNIN**	Gelatin test	-	+	+	+	+	-
		Braymer's test	-	+	+	+	-	-
9	**SAPONIN**	Lather test	+	+	+	-	+	+
		Froth test	+	+	+	-	-	+
10	**GLYCOSIDES**	Anthrone reagent test	-	+	+	+	-	-
		Borntrager's test	+	+	-	-	-	-
12	**FIXED OILS AND FATS**	Filter paper test	-	-	-	-	-	-
13	**VOLATILE OILS**	Filter paper test	+	+	-	-	-	-

Phytochemical screening of *Physalis Minima* with different extract presented Alkaloids, flavonoids, steroids and phenols in leaf extract and absence of Terpenoids, Anhtroquinone, saponin and tannin [4]. In the present study on preliminary analysis we also found alakloids, flavonoids and steroids from the ethanolic extract. These compounds were found in several studies [5,6]. The chemical study of *A. squamosa* from crude extract in three different solvent gave the presence of three major secondary metabolites (alkaloid, glycoside, flavonoid) in all three solvents [7]. The current investigation recorded 101compounds from all three extracts of leaf while Gonzalez-Esquinca *et al.,* [8] recorded approximately 500 alkaloids from 43 genera of annonaceans and Leboeuf *et al.,* [9] reviewed 319 compounds alkaloid and non-alkaloid compounds. Yadav *et al.,* [10] isolated and reported 12 synthetic compounds naturally from twig of *Annona squamosa* for their gastroprotective activity. The current study used GC-MS method

to study the chemo substances of *Lindernia antipoda* while Vanitha *et al.,* [11] studied the phytochemistry of *A. squamosa* by preliminary methods, TLC, HPLC and HPTLC with increasing order of polarity with crude extracts of ethanol. We found ethanolic extract contains many compounds the result of our investigation was in harmony with Zahid *et al.,* [12]. The chemical elucidation from leaf extract of *Lindernia antipoda* delineated that the plant has high potential for pharma industry and the advanced studies could uplift the plant to another level.

Table no 2: GC-MS analysis of *Lindernia antipoda* (L.) Alston in ethanolic extract

S.NO	COMPONENT NAME	*In vivo*	*In vitro*
1.	Ethyl oleate	+	+
2	9-Octadecenoic acid (Z)-, Ethyl ester Ethyl octadec-9-Enoate ethyl (9Z)-9-Octadecenoate (Z)-9	+	-
3	Glycidyl palmitate	+	+
4	Hexadecanoic acid, 2-Hydroxy-1,3-Propanediyl ester 2-Hydroxy-3-(Palmitoyloxy)Propyl Palmitate	+	+
5	Oleoyl chloride	+	+
6	9-Octadecenoic acid, 1,2,3-Propanetriyl ester, (E,E,E)	+	+
7	Ethanol, 2-(9,12-Octadecadienyloxy)-, (Z,Z)	+	-
8	Glycidyl oleate	+	+
9	Glycidyl palmitate	+	+
10	Glycidol stearate	+	+
11	Squalene	+	-
12	cis,cis-7,10,-hexadecadienal	-	+
13	9,12-Tetradecadien-1-ol, (Z,E)-	-	+
14	(E)-9-Octadecenoic acid Ethyl ester	-	+
15	Z-(13,14-Epoxy)Tetradec-11-en-1-ol Acetate	-	+
16	Cis-2-Hydroxy-4-Ethylcyclohexanol cis diol	-	+
17	13-Octadecenoic acid, Methyl ester, (Z)- cis-13-Octadecenoic Methyl ester	-	+
18	(Z)-Icos-11-en-1-yl Oleate	-	+
19	Oleic acid, 3-Hydroxypropyl ester 3-Hydroxypropyl (9E)-9-Octadecenoate 1-O-Cis-9-Octadecenoyl-1	-	+
20	9,12-Octadecadienoic acid (Z,Z)-, 2-Hydroxy-1-(Hydroxymethyl)ethyl ester	-	+
21	9,12-Octadecadienoic acid (Z,Z)-, 2-Hydroxy-1-(Hydroxymethyl)Ethyl ester 2-Hydroxy-1-(Hydroxymethyl)Ethylene	-	+
22	1H-cyclopropa[3,4]benz[1,2-E]Azulene-5,7b,9,9a-tetrol, 1a,1b,4,4a,5,7a,8,9-Octahydro-3-(Hydroxymethyl)-1,1,6,8-Tetramethyl-, 5,9,9A	-	+
23	Glyceryl Tridocasahexaenoate	-	-
24	2-Hydroxy-3-(9E)-9-octadecenoyloxy]propyl (9E)-9-octadecenoate (Z,Z)-1,3-Dioctadecenoyl glycerete	-	+
25	Propyleneglycol monoleate	-	+
26	Diethylmalonic acid, monochloride, hexadecyl este	-	+
27	Stigmasterol	-	+
28	Stigmasta-5,22-dien-3-ol, (3.beta.,22e)- (22E	-	+

Table no 3: GC-MS Analysis of *Lindernia antipoda* (L.) Alston in Ethyl acetate

S. NO	COMPONENT NAME	*In vivo*	*In vitro*
1	Glycidyl palmitate	+	+
2	Hexadecanoic acid, 2-Hydroxy-1,3-Propanediyl ester 2-Hydroxy-3-(Palmitoyloxy)propyl palmite	+	-
3	1,8,11-Heptadecatriene, (Z,Z)	+	-
4	Methyl 3-cis,9-cis,12-cis-octadecatrienoate	+	-
5	Glycidyl oleate	+	+
6	9-Octadecenoic acid, 1,2,3-propanetriyl ester, (E,E,E)	+	+
7	1-Bromo-11-iodoundecane	+	-
8	Glycidol stearate	+	+
9	2,3:5,6-Di-O-1-Cyclohexylieden-1,4-cyclohexandiallylether	+	-
10	7-Methyl-Z-tetradecen-1-ol acetate	+	-
11	Isopropyl linoleate	+	-
12	2(1H)-Naphthalenone, octahydro-4a,5-dimethyl-3-(1-methylethyl) (3.alpha.,4a.beta.,5.beta.,8a.alpha.)	+	-
13	Cyclohexane, (1-Butylhexadecyl) cyclohexane 5-Cyclohexyleicosane Eicosane,	+	-
14	Tricosane-8,10-dione	+	-
15	Pentacosane-8,10-dione	+	-
16	18, 19-Secolupan-3-ol, 3.Beta.,	+	-
17	2-Decenal, (E) (2E) 2-decenol (E)-Dec-2-en-1-al Trans-2-Zecenal Trans-dec-2-enal	-	+
18	Undecanal Undecenal Aldehyde iso c-11 Undecenoic Aldehyde Undecylene aldehyde	-	+
19	9-Octadecenoic acid, methyl ester, (E)	-	+
20	Hexadecanoic Acid, 2-Hydroxy-1,3-Propanediyl Ester 2-Hydroxy-3-(Palmitoyloxy)Propyl Palmitate	-	+
21	Oleoyl chloride	-	+
22	9-Octadecenoic acid (Z)-, 2,3-dihydroxypropyl ester	-	+
23	9,12-Octadecadienoic Acid (Z,Z)-, 2-Hydroxy-1-(Hydroxymethyl)Ethyl	-	+
24	2-Hydroxy-3-(9E)-9-Octadecenoyloxy Propyl (9E)-9-Octadecenoate (Z,Z)-1,3-Dioctadecenoyl Glycerol 1,3-Di Cis-9-Octadecenoyl Glycerol ,1,3-Diolein 1,3-Dioleoylglycerol 9-Octadecenoic Acid (9Z)-, 9-Octadecenoic Acid (Z)-, 2-Hydroxy-1,3-Propanediyl Ester	-	+
25	Methyl 2-hydroxy-octadeca-9,12,15-trienoate	-	+
26	9,12,15-Octadecatrienoic acid, (Z,Z,Z)	-	+
27	Z,Z,Z-4,6,9-Nonadecatriene	-	+
28	Cis-7,10,13-Hexadecatrienal	-	+
29	Octadecanoic Acid, 2-Hydroxy-1,3-Propanediyl Ester 2-Hydroxy-3-(Stearoyloxy)Propyl Stearate 1, 3-Di-O-Stearoylglycerol 1,3-Dioctadecanoylglycerol 1,3-Distearin 1,3-Distearin Glyceride 2-Hydroxypropane-1,3-Diyl Distearate Einecs Glycerin 1,3-Distearate Glycerol-1,3-Di Octadecanoate Glyceryl 1,3-Distearate Stearic Acid Diglycerte	-	+
30	Octadecanoic acid, 2-hydroxy-1-(hydroxymethyl)ethyl ester	-	+
31	6,11-Hexadecadien-1-Ol	-	+
32	Methyl 3-cis,9-cis,12-cis-octadecatrienoate	-	+
33	E,E,Z-1,3,12-Nonadecatriene-5,14-dio	-	+
34	Tricyclo 20.8.0.0(7,16) triacontane, 1(22),7(16)-diepoxy	-	+
35	Z,Z-6,28-Heptatriactontadien-2-one		+
36	Dichloroacetic acid, tridec-2-ynyl ester	-	+
37	1-Methyl-4-(2-Methyl-2-Oxiranyl)-7-Oxabicyclo 4.1.0Heptane .Alpha.-Limonene Diepoxide 1,2:8, 9-Diepoxylimonene 1,2:8,9-Diepoxy-P-Menthane 4-(1, 2-Epoxy-1-Methylethyl)	-	+

Table no 4: GC-MS analysis of *Lindernia antipoda* (L.) Alston in Methanolic extract

S.NO	COMPONENT NAME	*In vivo*	*In vitro*
1	9-Octadecenoic acid, methyl ester, (E)	+	+
2	2-Hexadecen-1-Ol, 3,7,11,15-Tetramethyl-, [R-[R*,R*-(E)]]- 3,7,11,15-Tetramethylhexadec-2-En-1-Ol (2E)-3,7,11,15-Tetramethyl-2-Hexadecen-1-Ol (2E)(7R,11R)-3,7,11,15-Tetramethylhexadec-2-En-1-Ol (2E)-3,7,11,15-Tetramethyl-2	+	-
3	Methyl stearate	+	+
4	Heptadecanoic acid, 16-methyl-, methyl ester	+	
5	Glycidyl palmitate	+	+
6	Hexadecanoic Acid, 2-Hydroxy-1,3-Propanediyl Ester 2-Hydroxy-3-(Palmitoyloxy)Propyl Palmitate	+	+
7	Bicyclo[10.1.0]Tridec-1-Ene (Isomer 2)	+	-
8	Glycidyl oleate	+	+
9	9-Octadecenoic acid, 1,2,3-propanetriyl ester, (E,E,E)	+	+
10	Glycidol stearate	+	+
11	10-Methoxy-Nb-.Alpha.-Methylcorynantheol	+	-
12	N~1~-(Sec-Butyl)-N~2~-(2-Ethylphenyl)Ethanediamide ,Oxamide, N-(2-Ethylphenyl)-N'-(1-Methylpropyl)	+	-
13	2-Pentadecanone, 6,10,14-trimethyl	-	+
14	Hexadecanoic acid, methyl ester	-	+
15	Hexadecanoic Acid, Methyl Ester Methyl Hexadecanoate Palmitic Acid Methyl Ester Aids-Einecs Emery –Hexadecan carbonsaeuremethylester Hsdb Metholene Methyl N-Hexadecanoate Methyl Palmitate Methylpalmitate N-Hexadecanoic Acid	-	+
16	9,12-Octadecadienoic acid (Z,Z)-, methyl ester	-	+
17	9,12-Octadecadienoic Acid (Z,Z)-, 2,3-Dihydroxypropyl Ester 2,3-Dihydroxypropyl (9Z,12Z)-9,12-Octadecadienoate	-	+
18	9-Octadecenoic acid (Z)-, methyl ester	-	+
19	Phytol	-	+
20	Octadecanoic Acid, Methyl Ester Methyl Octadecanoate Stearic Acid Methyl Ester Einecs , Emery Hsdb Kemester Metholene Methyl (Z)-9-Octadecenoate ,Methyl Ester Of Octadecanoic Acid Methyl N-Octadecanoate Methyl Stearate Methyl Ester Octadecanoic	-	+
21	Cyclooctane, (Methoxymethoxy)- (Methoxymethoxy)Cyclooctane Formaldehyde Cyclooctyl Methyl	-	+
22	Hahnfett	-	+
23	9,12-Octadecadienoic acid (Z,Z)-, 2,3-dihydroxypropyl ester	-	+
24	Oleic anhydride	-	+
25	Oleoyl chloride	-	+
26	9,12-Octadecadienoyl chloride, (Z,Z)	-	+
27	1,8,11-Heptadecatriene, (Z,Z)	-	+
28	2-Hydroxy-3-[(9E)-9-Octadecenoyloxy]Propyl (9e)-9-Octadecenoate (Z,Z)-1,3-Dioctadecenoyl Glycerol 1,3-Di(Cis-9-Octadecenoyl)Glycerol 1,3-Diolein 1,3-Dioleoylglycerol 2-Hydroxy-1,3-Propanediyl 9-Octadecenoic Acid (9Z)-, 2-Hydroxy-1,3-Propanediyl Ester (9ci) 9-Octadecenoic Acid (Z)-, 2-Hydroxy-1,3-Propanediyl Ester	-	+
29	Butyl 6,9,12,15-octadecatetraenoate	-	+
30	1,8,11,14-Heptadecatetraene, (Z,Z,Z)	-	+
31	Ethyl (9Z,12Z)-9,12-Octadecadienoate 9,12-Octadecadienoic Acid (Z,Z)-, Ethyl Ester Ethyl Cis,Cis-9,12-Octadecadienoate Ethyl Linolate Ethyl Linoleate	-	+
32	9,12,15-Octadecatrienoic acid, ethyl ester, (Z,Z,Z)	-	+
33	cis-9-Hexadecenal	-	+
34	9-Octadecenoic Acid (Z)-, 2-Hydroxy-1-(Hydroxymethyl)Ethyl Ester 2-Hydroxy-1-(Hydroxymethyl)Ethyl	-	+
35	Docosanoic acid, docosyl ester	-	+
36	Octadecanoic acid, 2,3-dihydroxypropyl ester	-	+

CONCLUSION

The semi-aquatic plant *Lindernia antipoda* (L.) Alston after the preliminary and GC-MS analysis study has showed more viable compounds that could be used to make drugs upon purification and pharmacological studies. The preliminary analysis report the presence of alkaloids and flavonoids in the tested solvents which form the basis for drug discovery to number of disease and the GC-MS analysis gave a total of 101

compounds. The compounds upon structural elucidation can be identified as beneficial of harmful and further can be used for drug preparation.

ACKNOWLEDGEMENT
The authors acknowledge the principal, research scholars for help rendered in conducting the research.

CONFLICT OF INTEREST
The authors have no conflict of interest

AUTHOR CONTRIBUTIONS
Rajkumar P- Contributed in conducting experiment, collecting and analysing data, paper preparation; Dr. Jahirhussain G- Research supervisor; Karuniya Raja Viella G- Data analysis and interpretation.

REFERENCES

1. Desale, M.K,, Bhamare, P.B., Sawant, P.S., Patil, S.R., & Kamble SY. (2013). Medicinal plants used by the rural people of Talukapurandhar, district Pune, Maharashtra. *Indian Journal of Traditional Knowledge.,* 12(2): 334-338.
2. Dastur, J.F. (1985). Medicinal plants of India and Pakistan. D.B. Taraporevala, Bombay.
3. Valsaraj, R., Pushpagandan, P., Smitt, U.W,, Adersen, A., & Nyman, U. (1997). Antimicrobial screening of selected medicinal plants from India. *Journal of Ethnopharmacology.*, 58, 75-83.
4. Jagajothi Angamuthu, Manimekalai Ganapathy, Vasthi Kennedy Evanjelene, Nirmala Ayyavuv, & Vasanthi Padamanabhan. (2014). Evaluation of Phytochemical Analysis and Antimicrobial Activity of Leaf and Fruit Extracts of *Physalis Minima. International Journal of Emerging Technology and Advanced Engineering*., 4(1): 462 - 465.
5. Vandana Bharthi, Prathapa Reddy, M., Shantha, T.R., & Venkateshwarlu, G. (2016). Phytochemical evaluation and powder microscopy of medicinal and nutritional fruits of P*hysalis peruviana* L. *International Journal of Herbal Medicine*., 4(1): 43-46.
6. Kalidindi, N., Thimmaia, N.V., Jagadeesh, N.V., Nandeep, R., Swetha, S., & Kalidindi, B. (2015). Antifungal and antioxidant activities of organic and aqueous extracts of *Annona squamosa* Linn. leaves. *Journal of Food and Drug Analysis*., 23(4): 795–802. doi:10.1016/j.jfda.2015.04.012.
7. Neethu Simon, K., Santhoshkumar, R., & Neethu S Kumar. (2016). Phytochemical analysis and antimicrobial activities of *Annona squamosa* (L) leaf extracts. *Journal of Pharmacognosy and Phytochemistry.,* 5(4): 128-131.
8. González-Esquinca, A.R., De-La-Cruz-Chacón, I., Castro-Moreno, M., Orozco-Castillo, J.A., & Riley- Saldaña, C.A. (2014). Alkaloids and acetogenins in Annonaceae development: biological considerations. *Revista Brasileira de Fruticultura.*, 36(spe1), 01–16. doi:10.1590/s0100-29452014000500001.
9. Leboeuf, M., Cavé, A., Bhaumik, P.K., Mukherjee, B., & Mukherjee, R. (1980). The phytochemistry of the annonaceae. *Phytochemistry.*, 21(12), 2783–2813. doi:10.1016/0031-9422(80)85046-1.
10. Yadav, D.K., Singh, N., Dev, K., Sharma, R., Sahai, M., Palit, G., & Maurya, R. (2011). Anti-ulcer constituents of *Annona squamosa* twigs. *Fitoterapia.*, 82(4), 666–675. doi:10.1016/j.fitote.2011.02.005.
11. Vanitha Varadharajan, Umadevi Kumba Janarthanan, & Vijayalakshmi Krishnamurthy. (2012). Physicochemical, Phytochemical Screening and Profiling Of Secondary Metabolites of *Annona Squamosa* Leaf Extract. *World Journal of Pharmaceutical research.,* 1 (4), 1143-1164.
12. Zahid, M., Arif, M., Rahman, M.A., Singh, K., & Mujahid, M. (2017). Solvent Extraction and Gas Chromatography–Mass Spectrometry Analysis of *Annona squamosa* L. Seeds for Determination of Bioactives, Fatty Acid/Fatty Oil Composition, and Antioxidant Activity. *Journal of Dietary Supplements.,* 15(5), 613–623.

CITATION OF THIS ARTICLE
Rajkumar P, Jahirhussain G* and Karuniya Raja Viella G. Elucidation of Secondary Metabolites From *Lindernia antipoda* (L.) Alston. Bull. Env.Pharmacol. Life Sci., Vol 11 [8] July 2022 : 15-21