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GC-MS profiling and phytochemical quantification in methanolic extract of *Bidens tripartita*

Eboh Abraham Sisein ^{1,*}, Azibanasamesa DC Owaba ² and Robert Owabhel Faith ¹

¹ Department of Biochemistry, Faculty of Basic Medical Science, Niger Delta University, Bayelsa State, Nigeria.

² Department of Pharmaceutical and Medicinal Chemistry, Faculty of Pharmacy, Niger Delta University, Wilberforce Island Bayelsa State, Nigeria.

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Abstract

Bidens tripartita (Asteraceae) is a weed like plant commonly known as Burmarigold. It is found in water logged and wet regions. The leaves of *Bidens tripartita* were harvested, dried and grounded. The powdered leaves were extracted with methanol, the extract was processed into a paste and stored in the refrigerator. Standard quantitative spectrophotometric methods were applied to quantify total phenol, flavonoid and alkaloid. Gas chromatography mass spectrometry (GC-MS) evaluation of methanolic leaf extract of *Bidens tripartita* was according to standard procedures. The phytochemical results showed total phenol 83.35 ± 1.17 mgGAE/g, total flavonoid 10.12 ± 0.05 mgQE/g, total alkaloid 4.5 ± 0.73 %. The GC-MS also reveals many Medicinal compounds like Caryophyllene, Spathulenol, N-butylbenzenesulfonamide, Methyl palmitoleate, 9,12-octadecadienoic acid methyl ester, Phytol, Gamma tocopherol, Vitamin E, Campesterol, Stigmasterol. Conclusively *Bidens tripartita* contains a lot of Medicinal phytochemicals that can be harnessed through extensive extraction for the development of a drug.

Keywords: Phytochemicals; *Bidens tripartita*; GC-MS; Phenol; Flavonoid; Vitamin E

1. Introduction

Bidens tripartita is an annual weed like plant of 30 – 100 cm high and grows in damp places, rivers, water logged and marshy areas (Kupichan, 1997). *Bidens tripartita* is a plant that bears flowers and belong to the family Asteraceae (Sandi *et al.*, 2012). *Bidens tripartita* is also known as Bur-marigold and is applied to cure and manage ruptured blood vessels it is also useful in the management of diseases of the skin, hotness of the body, bladder and kidney troubles (Ozarowski, 1993 and Strzelecka and Kowalski, 2000). The extract of *Bidens tripartita* has been shown to inhibit cancer cell lines in mouse (Goun *et al.*, 2002). *Bidens tripartita* also inhibited many enzymes like acetylcholinesterase, butyrylcholinesterase, alpha amylase and alpha glycosidase, antihyperglycemic and antioxidant potentials (Organ *et al.*, 2016, Tomczykowa *et al.*, 2011, Wolniak *et al.*, 2007 and Uysal *et al.*, 2018). *Bidens tripartita* is commonly used in the treatments of angina, infection of the respiratory tract, anti-inflammation in colon and gout (Sokolov, 2000). It is also use for the treating of diabetics (Andrade-Cetto and Heinrich, 2005). *Bidens tripartita* is added during spicing of foods like salads, soups and stew (Morton, 1962). This research sought to quantitatively detect phytocompounds in the methanolic extract of *Bidens tripartite* and GC-MS profiling which is very rare in many literatures about *Bidens tripartita* that makes this research important.

*Corresponding author: Eboh Abraham Sisein

2. Material and methods

2.1 Chemicals

Acetic acid, ethanol sodium carbonate, gallic acid, methanol, sodium nitrite, aluminum chloride, sodium hydroxide, quercetin, ammonium hydroxide, diethyl ether, n-butanol, sodium chloride, Folin reagent were all of analytical grade.

2.2 Plant collection

The plant leaves of *Bidens tripartita* were collected from a farm in Wilberforce Island, Bayelsa State. The plant was identified in the Department of Botany, Niger Delta University, Bayelsa State.

2.3 Methanolic Extracts of *Bidens tripartita*

The fresh leaves of *Bidens tripartita* were harvested, washed and shade dried for a period of fourteen days. The dried leaves were crushed to a powdered particles. The powdered leaves were weighed, soaked in methanol with occasional shaking at room temperature for 72 hrs. The extract was sieved through Whatman number 4 filter paper. The filtrate collected was concentrated at 65°C. The paste formed was stored in the refrigerator for further analysis.

2.4 Phytochemical analysis

The method of Zhishen *et al.* 1999, was employed for the evaluation of total flavonoid content of *Bidens tripartita*. The colorimetric method of Singleton *et al.* 1999 and Demiray *et al.* 2009 was used for the analysis of total phenol content of *Bidens tripartita* extract. The gravimetric method of Evans and Harborne (1991) was used for determining total alkaloid contents of the dried leaves of *Bidens tripartita*.

2.5 GC-MS analysis

Methanolic extract of *Bidens tripartita* leaves were subjected to gas chromatography mass spectrometry according to standard protocols.

2.6 Statistical analysis

The data obtained were subjected to statistical analysis using SPSS package software.

3. Results

3.1 Percentage yield

Percentage yield (%) = 24.71 %

Table 1 Depicting results of total flavonoid, phenol and alkaloid in *Bidens tripartite*

Phytochemicals	Quantitative values
Flavonoid	10.12±0.05 mgQE/g
Phenol	83.35±1.17 mgGAE/g
Alkaloid	4.5±0.73 %

The table above shows the various phytochemicals present in *Bidens tripartita* and the quantity of each phytochemical content. Each value mean ± SD of triplicate values. GAE= Gallic Acid Equivalent, QAE= Quercetin equivalent

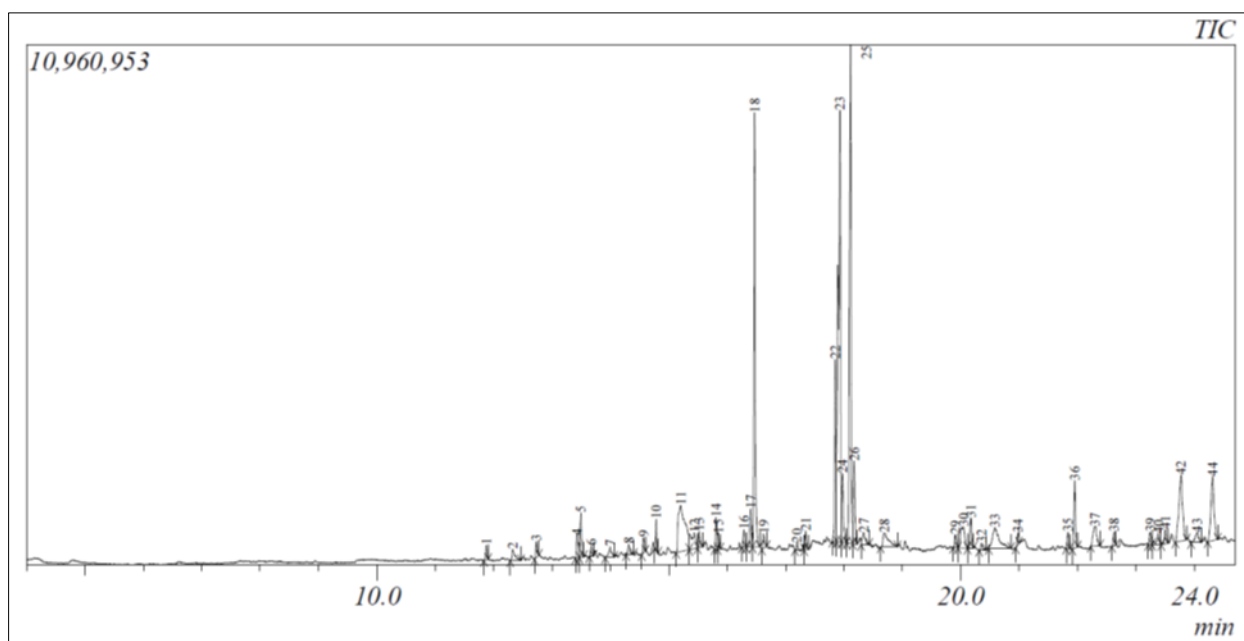


Figure 1 GC-MS of methanolic extract of *Bidens tripartite*

Table 2 Phytochemicals detected in GC-MS analysis of *Bidens tripartite* methanolic extract

Name	Formular	MW	RT	% area
Caryophyllene	C15H24	204	11.87	0.38
4-(2,4,4-trimethyl-cyclohexa-1,5-dienyl)-but-3-ene-2-one	C13H18O	190	12.32	0.74
1-methyl-4-(5-methyl-1-methylene-4-hexenyl-cyclohexane	C15H24	204	12.73	0.48
Spathulenol	C15H24O	220	13.42	0.89
Patchoulane	C15H26	206	13.49	1.14
1-chloro-octadecane	C18H37Cl	288	13.67	0.30
7-hydroxyfarnesin	C15H24O	220	13.99	0.57
2-methyl-4-(2,6,6-trimethyl-1-cyclohexen-1-yl)-2-butenal	C14H22O	206	14.31	0.41
1-(7-hydroxy-5-methoxy-2,2-dimethyl-2H-1-benzopyran-6-yl)-ethanone	C14H16O4	248	14.56	0.43
1-(cyclohexylmethyl)-2-methyl-cyclohexane	C14H26	194	14.78	0.67
N-butyl-benzenesulfonamide	C10H15N2S	213	15.20	6.31
Heptadecyl-3-chloropropanoate	C20H39ClO2	346	15.44	1.49
N-nonadecane	C19H40	268	15.51	0.56
6,10,14-trimethyl-2-pentadecanone	C18H36O	268	15.81	0.87
Z-9-dodecenyl acetate	C14H26O2	226	15.85	0.38
Methyl palmitoleate	C17H32O2	268	16.28	0.49
Methyl-cis-6-octadecenoate	C19H36O2	296	16.40	1.11
N-hexadecanoic acid methyl ester	C17H34O2	270	16.46	11,58
Dibutyl phthalate	C16H22O4	278	16.62	0.54
Heptadecane	C17H36	240	17.19	0.31

Trans, trans farnesyl acetate	C17H28O2	264	17.34	0.48
9,12-octadecadienoic acid methyl ester	C19H34O2	294	17.85	5.20
Oleic acid methyl ester	C19H36O2	296	17.92	20.83
10-octadecenoic acid methyl ester	C19H36O2	296	17.97	1.91
Phytol	C20H40O	296	18.10	15.63
Octadecenoic acid methyl ester	C19H38O2	298	18.17	2.41
N-(2-methoxyethoxycarbonyl)-pentadecyl ester	C24H47O5	429	18.33	0.65
Methyl-9-cis, 11-trans-octadecadienoate	C19H34O2	294	18.69	1.56
Cis-11-eicosenoic acid methyl ester	C21H40O2	324	19.90	0.40
2-methyl tetracosane	C25H52	352	20.04	1.68
Methyl-18-methylnonadecenoate	C21H42O2	326	20.17	0.93
4,8,12,16-tetramethylheptadecan-4-olide	C21H40O2	324	20.35	0.27
Gamma tocopherol	C28H48O2	416	20.58	2.73
Octadecane	C18H38	254	20.97	0.33
Heneicosane	C21H44	296	21.83	0.46
Docosanoic acid methyl ester	C23H46O2	354	21.94	1.99
Vitamin E	C29H50O2	430	22.29	1.47
Eicosane	C20H42	282	22.62	0.38
1-docosanol	C22H46O	326	23.24	0.46
2-bromotetradecane	C14H29Br	276	23.38	0.57
Methyl lignocerate	C25H50O	382	23.50	0.54
Campesterol	C28H48O	400	23.77	4.74
All trans farnesyl acetate	C17H28O2	264	24.04	0.75
Stigmasterol	C29H48O	412	24.31	3.97

RT= retention time MW= molecular weight

4. Discussion

The percentage yield of *Bidens tripartita* was 24.71 %. The phytochemical results showed total phenol 83.35±1.17 mgGAE/g, total flavonoid 10.12±0.05 mgQE/g and total alkaloid 4.5±0.73 %. The GC-MS analysis revealed 44 compounds as shown on table 2 above.

Caryophyllene is a double cyclic sesquiterpene that is a constituent of many oils, caryophyllene detected from *Bidens tripartita* protects tissues by modulating many signaling cascades and inhibiting inflammatory-cytokines, chemokine, eicosanoids. Therefore through molecular docking studies caryophyllene is an active compound that can prevent infection, modulate immunity and inhibit inflammation in COVID-19 (Jha *et al.*, 2021). N-butyl-benzenesulfonamide is another important phytochemical of industrial importance and acts as a plasticizer and also in producing resins (Kumar *et al.*, 2007; Strong *et al.*, 1991). N-butyl-benzenesulfonamide in *Bidens tripartita* also possesses fungicidal properties, that is why *Bidens tripartita* is also antifungal (Kim *et al.*, 2000). Spathulenol and many other essential oils detected in GC-MS analysis of *Bidens tripartita* possess antioxidant properties, antimicrobial and anti-inflammatory (Nascimento *et al.*, 2017). The fatty acid 9,12-octadecadienoic acid methyl ester in *Bidens tripartita* is an essential fatty acid with antibacterial activities (Dilika *et al.*, 2000). Phytol is a linear diterpene having an –OH group commonly found in plants. Phytol shows anti-inflammatory activity and antibacterial (Saikia *et al.*, 2010). Gamma tocopherol and alpha tocopherol (vitamin E) are all dietary supplements that possess antiradical properties in hydrophobic medium due to the chroman ring (Traber, 2012). Phytosterol like stigmasterol and campesterol found in *Bidens tripartita* have same biological

features like cholesterol in animals, phytosterol have hypocholesterolemic capacity and can decrease heart diseases (Kamal-Eldin and Moazzami, 2009).

5. Conclusion

The extract of *Bidens tripartita* revealed many phytochemicals that individually contributed to the Medicinal potential of *Bidens tripartita*. Other bioactive of importance are all trans farnesyl acetate, Methyl lignocerate, Docosanoic acid methyl ester, 4,8,12,16-tetramethylheptadecan-4-olide, Methyl-9-cis-11-trans-octadecadienoate, N-(2-methoxyethoxycarbonyl)-pentadecyl ester. Rich extracts or subfractions are needed to obtain pure bioactive that can be use as supplements or as drug.

Compliance with ethical standards

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Disclosure of conflict of interest

There are no conflict of interests.

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