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STUDIES ON GC-MS ANALYSIS OF BLACK PEPPER (*Piper nigrum*) AND PAWPAW (*Carica papaya*) SEEDS USING METHYLATED SPIRIT AND HEXANE EXTRACT

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ABSTRACT
The study was carried out to determine the phytochemical compounds present in the black pepper and pawpaw seeds extract using gas chromatography analytical techniques. Interpretation of each compounds identified from GC-MS analysis was conducted using the database of National Institute Standard and Technology (NIST) library. Identification of compounds was done by comparing the mass spectrum fragmentation pattern of each of the constituents in the methylated spirit and hexane fraction with those stored in the NIST library. The result revealed presences of compounds like Oleic Acid (29.43%), piperine (3.19%), Caryophyllene (1.24%), n-Hexadecanoic acid (21.12%), l-(+)-Ascorbic acid 2,6-dihexadecanoate (1.15%), Naphthalene, 1,2,3,4,4a,5,6,8a-octahydro- (2.68%), Hexadecanoic acid (0.82%), 9-Octadecenamide (39.87%), Heptadecanoic acid (15.65%) and 9,12-Octadecadienoic acid (Z,Z)- (4.79%) in methylated spirit and hexane extract of black pepper and pawpaw seeds. These compounds have potential anti-microbial, anti-oxidant, pesticide and anticancer activity. The study provided a detailed comparison of detection and identification of various bioactive phytochemicals from of black pepper and pawpaw seeds. The study recommended the use of these plants (black pepper and pawpaw seeds) for the pest control and pharmaceutical.

Keywords: Black pepper, G.C-MS analysis, Hexane extract, Methylated spirit extract, Pawpaw.

INTRODUCTION
Pepper is a spice plant from the class Magnoliopsida, orders piperales and family piperaceae, is an important plant that has culinary, medicinal, cosmetic and insecticidal uses (Juliani *et al*., 2013; and Besong *et al*., 2016). The plant is found in tropical regions of central and West Africa, where it is semi-cultivated in countries like Nigeria, especially in the southern parts. It is known in Nigeria as '*Uziza*' (Igbo), '*Iyere*' (Yoruba) and '*Masooro*' (Hausa). Pepper is an important source of various nutrients and phytochemicals such as proteins, carbohydrates, vitamins, minerals, fat, alkaloids, steroids, lignins, glycosides, saponins, flavonoids, tannins and phenolic compounds. It is also known to have antibacterial, antioxidant, anti-inflammatory, hepatoprotective, fertility, aphrodisiac, anticonvulsant and larvicidal properties (Echo *et al*., 2012; Okoye and Ebeledike, 2013; Nwankwo *et al*., 2014; Besong *et al*., 2016; and Ukpai *et al*., 2017). The seeds contain piperine and chavicine, which have been reported to have active insecticidal ingredients (Okunlola *et al*., 2014). Recent studies have shown that *Piper nigrum* can be used as an alternative in the control of insect pests in vegetable production.

Pawpaw *Carica papaya* is Native to Mexico and northern South America, has become naturalized throughout the Caribbean Islands, Florida, Texas, California, Hawaii, and other tropical and subtropical regions of the world (Heywood *et al*., 2007). The papaya is a small, sparsely branched tree, usually with a single stem growing from 5 to 10 m (16 to 33 ft) tall,

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with spirally arranged leaves confined to the top of the trunk. The lower trunk is conspicuously scarred where leaves and fruit were borne.

The seeds of *Carica papaya* (L.) (Caricaceae) proved to be toxic to first instar larvae of the insects. In addition, powder from *C. papaya* cultivar Mammee seeds Figueroa-Brito *et al*., 2002) as well as those of the Maradol, Yellow and Ha- waiian cultivars in concentrations of 10, 15 and 20% were highly toxic and caused 100% mortality rates of larvae of *S. frugiperda* in less than 96 hours. Franco *et al*. (2006) evaluated the insecticidal effects of different powdered seeds against this insect, and found that the seeds of *C. papaya* caused high levels of larval mortality. The contraceptive efficacy, reversibility, and toxicity of *C. papaya* seed products have also been investigated in rats and rabbits (Lohiya *et al*., 2001).

MATERIALS AND METHODS

Collection and Preparation of Black Seed Pepper and Pawpaw Seed

The pawpaw seed (*Carica papaya* L.) were collected from the pawpaw trees from Muda market Bauchi metropolis. The pawpaw was cut off and the seeds were collected dried under the shade dried for two weeks and it was grounded with pestle and morta separately. Black pipper (*Piper nigrum* L.) seeds was obtained from the same market and it was shade dried and grounded with morta and pestle to obtain a fine powder of the product as describe by (Godara *et al*., 2019). The fine powder of each plant materials were separately kept on the leather until when needed.

Extraction Method

The Pawpaw and Black pepper seeds powder was extracted using methylated spirit and hexane solvent individually. The extraction was performed by weighing 85g of grounded samples, mixing them with 250mL of each hexane and methylated in 500mL conical flask and it was subjected to soaking for 24 hours. The solvent suspension was filtered and concentrated using rotary evaporator to yield the crude extract. The crude extracts were stored in an amber bottle at 4^0C. Thus 170g of stem bark powder was divided in two, 85g of it was dissolved in 250mL of methylatedl and the other 85g was dissolved in 250mL of hexane.

Identification of the Components

Interpretation of each of from GC-MS analysis was conducted using the database of National Institute Standard and Technology (NIST) library. Identification of compounds was done by comparing the mass spectrum fragmentation pattern of each of the constituents in the methylated spirit and hexane fraction with those stored in the NIST library.

Gas Chromatography-Mass Spectrometry (GC-MS) Analysis of Soxhlet Extracted Oils

The extract oil was analysed separately, one after another by subjecting them to chemical profiling via GC-MS technique. The analysis was perform using a GCMS-QP2010SE SHIMADZU,JAPAN equipped with GC-2010 capillary column with Plunger Speed (Injection) high, viscosity comp time: 0.2 sec pumping time: 1 sec. Injecting volume 1uL, Injection Mode: Splitless, Purge Flow: 3.0 mL/min, Pumping Times: 3, port dwell time: 0.3 sec. The oven temperature was set between 60.0^0C to 280.0^0C, hold time between 1.00-5.00min at a rate of 10^oC/min. The was equilibrium time of 1.0 min, ion source temperature: 230-00^oC, interface temperature: 250.00^oC, solvent cut time: 3.50 min, threshold: 1000, start time: 4.50 min, end time: 21.80 min, event time: 0.50sec, Start m/z 45.00, End m/z: 700.00, and scan speed: 1428, sample inlet unit: GC. Washing volume: 8 UL, column oven temperature 60.0^oC, injection temperature: 250.00^oC, flow control mode: linear velocity, pressure, 108. kPa, total flow: 9.8 mL/min, column flow; 3.22 mL/min, linear velocity: 46.3 cm/sec, and purge flow: 3.0mL/min, split ratio: 1.1. The chemical compounds in the oil were identified based on GC retention time on GC-2010 capillary column matched with EL MS library of the

NIST/EPA/NIH mass spectral library according to National Institute Standard and Technology [NIST] (2005). The analysis was carried out Bob Global Resources Limited www.bobglobalresources.com.

RESULTS AND DISCUSSION

Bio-activity of Chemical Compounds in Methylated Spirit and Hexane Extract of Black Pepper

The result of GC-MS analysis revealed the presence of 70, 27, 39 and 39 bio-active compounds in Black pepper Methylated spirit, Black pepper Hexane, Pawpaw mentholated spirit and pawpaw hexane extract, respectively. In the study, 10 compounds with the highest peak area percentage were reported on the basis of their peak area percentage. The compounds with the highest peak area percentage in methylated spirit extract of black were piperine (26.22%) followed by Caryophyllene oxide (9.28%), n-Hexadecanoic acid (2.96%), 3-Amino-4-piperonyl-5-pyrazolone (2.83%), 2-propenoic acid, 3-phenyl-, methyl ester (2.70%), Naphthalene, 1,2,3,4,4a,5,6,8a-octahydro-4a (2.68%), Decalin, syn-1-methyl-, cis- (2.43%), alpha.-Guaiene (2.40%), Pyrimidine-2,4,6(1H,3H,5H)-trione,5-(2-hydroxy-1 (2.26%), 9,12-octadecadienoylchloride, and (Z,Z)- (1.96%) as presented in Table 1.

Further in Table 1, the compound identified in hexane extract of black pepper were Oleic Acid (29.43%) followed by Heptadecanoic acid (15.65%), 9-Octadecenoic acid (14.81%), n-Hexadecanoic acid (9.30%), 9-octadecenoic acid (Z)- (8.97%), Hexadecanoic acid (5.67%), Piperine (3.05%), Hexadecanoic acid, methyl ester (2.88%), Octadecanoic acid (1.37%) and l-(+)-Ascorbic acid 2,6-dihexadecanoate (1.15%).

Piperine, Caryophyllene oxide, n-Hexadecanoic acid, Naphthalene, Oleic Acid, Heptadecanoic acid, 9-octadecenoic acid, Hexadecanoic acid, Octadecanoic acid and l-(+)-Ascorbic acid 2,6-dihexadecanoate were the compounds that have a reported bioactivity including nematicide, pesticide, antiandrogenic flavour, antifungal, antioxidant, hypocholesterolemic, haemolytic, 5-alpha reductase inhibitor, and potent antimicrobial activity as reported by Mohammed *et al*. (2016), Anyim *et al*. (2015), Bawa *et al*. (2014) Syeda *et al*. (2011) and Godara *et al*., (2019).

Bio-activity of Chemical Compounds in Methylated Spirit and Hexane Extract of Pawpaw

Table 2 showed the compounds with the highest peak area percentage in methylated spirit and hexane extract of Pawpaw. 9-Octadecenoic acid (34.87%) have the highest peak area percentage followed by n-Hexadecanoic acid (21.12%), Ethyl Oleate (19.72%), Oleoyl chloride (3.40%), Piperine (3.19%), 10-Octadecenoic acid (3.13%), Caryophyllene (1.24%), Benzene, (isothiocyanatomethyl)- (0.93%), gamma.-Sitosterol (0.92%) and Hexadecanoic acid (0.82%).

The predominant compounds identified in Hexane extract of pawpaw seeds were 4,8-Methanoazulen-9-ol (15.72%) followed by Piperine (8.87%), 5H-3,5a-Epoxynaphth[2,1-c]oxepin (8.06%), Caryophyllene (7.29%), 6-Octadecenoic acid (6.39%), Octanoic acid (5.62%), 9,12-Octadecadienoic acid, methyl ester (4.79%), 9-Octadecenoic acid, methyl ester, (E)- (4.33%), 2H-3,9a-Methano-1-benzoxepin (3.10%), Cholestan-3-one and 4,4-dimethyl (3.04%).

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Table 1: Bio-activity of Chemical Compounds Identified in Methylated Spirit and Hexane Extract of Black Pepper Using GC-MS analytical Techniques

Solvent	Compound Name	Peak area (%)	Retention Time (sec.)	Bio-activity and Reference
Methylated spirit	Piperine	26.22	21.39	Anti-pyretic and analgesic activity, pesticide (Mohammed *et al*., 2016).
	Caryophyllene oxide	9.28	11.51	Anti-inflammatory, antibiotic, antioxidant, anti-carcinogenic and local anaesthetic (Mohammed *et al*., 2016).
	n-Hexadecanoic acid	2.96	15.82	Insecticides, anti-arthritis, In treatment of skin diseases (Sunita *et al*., 2017)
	3-Amino-4-piperonyl-5-pyrazolone	2.83	19.53	No activity reported.
	2-Propenoic acid, 3-phenyl-, methyl ester	2.70	21.62	No activity reported.
	Naphthalene, 1,2,3,4,4a,5,6,8a-octahydro-4a	2.68	12.15	Anti-bacterial (Mohammed *et al*., 2016).
	Decalin, syn-1-methyl-, cis-	2.43	20.44	No activity reported.
	alpha.-Guaiene	2.40	12.24	No activity reported.
	Pyrimidine-2,4,6(1H,3H,5H)-trione,5-(2-hydroxy-1	2.26	19.56	No activity reported.
	1,3,3-Trimethylcyclohex-1-ene-4-carboxaldehyde	2.20	20.83	No activity reported.
Total		55.93		
Hexane	Oleic Acid	29.43	17.29	Cancer preventive Flavor, pesticide, Hypocholesterolemic 5-Alpha reductase inhibitor Antiandrogenic, Perfumery Insectifuge, Anti-inflammatory Anemiagenic, Dermatitigenic Choleretic (Balamurugan *et al*., 2017)
	Heptadecanoic acid	15.65	16.91	Anti-microbial (Sunita *et al*., 2017)
	9-Octadecenoic acid	14.81	16.81	Pesticide, Anti-hypertensive, increase HDL and decrease LDL (Sunita *et al*., 2017)
	n-Hexadecanoic acid	9.30	16.00	Antiarthritis, In treatment of skin diseases (Sunita *et al*., 2017)
	9-Octadecenoic acid (Z)-	8.97	19.99	Insecticide, anti-hypertensive, increase HDL and decrease LDL (Sunita *et al*., 2017)

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Table 1: Bio-activity of Chemical Compounds Identified in Methylated Spirit and Hexane Extract of Black Pepper Using GC-MS analytical Techniques **Cont'd.**

Solvent	Compound Name	Peak area (%)	Retention Time (sec.)	Bio-activity and Reference
	Hexadecanoic acid, methyl ester	2.88	18.97	Antioxidant, Hypocholesterolemic Nematicide, Pesticide Lubricant, Antiandrogenic Flavor, Hemolytic (Balamurugan *et al*., 2017)
	Octadecanoic acid	1.37	20.11	Anti-fungal, Antibacterial, Anti-microbial, Emulsifier, Perfumery Industry (Sunita *et al*., 2017)
	l-(+)-Ascorbic acid 2,6-dihexadecanoate	1.15	15.79	Anti-oxidant, cardio protective, cancer preventive, infertility agent. (Godara *et al*., 2019)
Total		91.58		

Also, following the results of Table 2, the compound identified in methylated and hexane extract of pawpaw seeds which were 10-Octadecenoic acid, 9-Octadecenoic acid, n-Hexadecanoic acid, Caryophyllene, Piperine, 9,12-Octadecadienoic acid, methyl ester and 9-octadecenoic acid, methyl ester, (E)- were the compounds that have nematicide, pesticide, antiandrogenic flavour, antifungal, antioxidant, hypocholesterolemic, haemolytic, 5-alpha reductase inhibitor, potent antimicrobial antiarthritis, In treatment of skin diseases, anticarcinogenic and local anaesthetic as reported by Mohammed *et al*. (2016) and (Sunita *et al*., 2017).

GC-MS Analysis of Mentholated Spirit Extract of Black Pepper

Table 3 showed the Molecular weight, molecular formula and chemical structure of identified with GC-MS analysis. The result revealed that Pyrimidine-2,4,6(1H,3H,5H)-trione, 5-(2-hydroxy-1 having the highest (310 (g/mol.) molecular weight followed by 9,12-Octadecadienoylchloride, (Z,Z)- (298 g/mol.) Piperine (285 g/mol.), 3-Methoxybenzoic acid (262 g/mol), n-Hexadecanoic acid (256 g/mol.) 3-Amino-4-piperonyl-5-pyrazolone (233 g/mol.), Caryophyllene oxide (220 g/mol.), Cyclohexene,4-ethenyl-4-methyl-3-(1-methylethenyl) alpha.-Guaiene and Naphthalene,1,2,3,4,4a,5,6,8a-octahydro-4a having the lowest (204 g/mol.).

The higher molecular weight in the compound reported in Table 3 could result in higher bioactivity and this corroborates the finding of Francois *et al*. (2009) who earlier reported that the dichloromethane extracts of *P. nigrum* has pesticidal activity against *C. masulatus and S. zeamais* due to high concentration of piperine. The Antifungal activity of *Piper nigrum* has also been reported by Ahmad *et al.* (2011) against bean rust.

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Table 2: Bio-activity of Chemical Compounds Identified in Methylated Spirit and Hexane Extract of Pawpaw Using GC-MS analytical Techniques

Solvent	Compound Name	Peak Area (%)	Retention time (Min.)	Bio-activity and reference
Methylated spirit	9-Octadecenoic acid	34.87	17.61	Pesticide, anti-hypertensive, increase HDL and decrease LDL (Sunita *et al*., 2017)
	n-Hexadecanoic acid	21.12	16.20	Antiarthritis, In treatment of skin diseases (Sunita *et al*., 2017)
	Ethyl Oleate	19.72	17.25	No activity reported.
	Oleoyl chloride	3.40	20.03	No activity reported.
	Piperine	3.19	21.31	No activity reported.
	10-Octadecenoic acid	3.13	16.72	Anti-microbial, therapeutic
	Caryophyllene	1.24	11.49	Anti- inflammatory, antibiotic, antioxidant, anti-carcinogeni c and local anaesthetic (Mohammed *et al*., 2016).
	Benzene, (isothiocyanatomethyl)-	0.93	10.36	No activity reported.
	gamma.-Sitosterol	0.92	20.51	No activity reported.
Total		88.52		
Hexane	4,8-Methanoazulen-9-ol,	15.72	20.27	No activity reported.
	Piperine	8.87	21.18	Anti-pyretic and analgesic activity, pesticide (Mohammed *et al*., 2016).
	5H-3,5a-Epoxynaphth[2,1-c]oxepin	8.06	18.21	No activity reported.
	Caryophyllene	7.29	11.48	Pesticide, anti- inflammatory, antibiotic, antioxidant, anti-carcinogeni c and local anaesthetic (Mohammed *et al*., 2016).
	6-Octadecenoic acid	6.39	19.23	No activity reported.
	Octanoic acid	5.62	21.26	No activity reported.
	9,12-Octadecadienoic acid, methyl ester	4.79	16.64	Hepatoprotective, Anti-histaminic, Antieczemic , Hypocholesterolemic (Sunita *et al*., 2017)
	9-Octadecenoic acid, methyl ester, (E)-	4.33	16.69	Anti-hypertensive, increase HDL and decrease LDL (Sunita *et al*., 2017)
	2H-3,9a-Methano-1-benzoxepin,	3.10	21.01	No activity reported.
	Cholestan-3-one, 4,4-dimethyl-	3.04	20.50	No activity reported.
Total		67.21		

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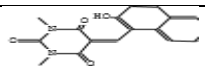
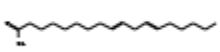
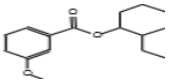
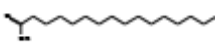
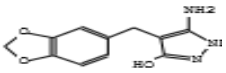
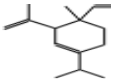
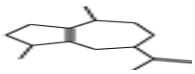
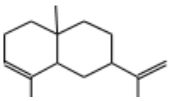
Table 3: Chemical Composition, Molecular Weight, Molecular formula and Chemical Structure of Mentholated Spirit Extract of Black Pepper Revealed by GC-MS Analysis

S/N	Compound Name	Molecular Weight	Molecular formula	Chemical Structure
1	Pyrimidine-2,4,6(1H,3H,5H)-trione, 5-(2-hydroxy-1	310	$C_{17}H_{14}N_2O_4$	
2	9,12-Octadecadienoylchloride, (Z,Z)-	298	$C_{18}H_{31}C_lO$	
3	Piperine	285	$C_{17}H_{19}NO_3$	
4	3-Methoxybenzoic acid	262	$C_{16}H_{22}O_3$	
5	n-Hexadecanoic acid	256	$C_{16}H_{32}O_2$	
6	3-Amino-4-piperonyl-5-pyrazolone	233	$C_{11}H_{11}N3O_3$	
7	Caryophyllene oxide	220	$C_{15}H_{24}O$	
8	Cyclohexene,4-ethenyl-4-methyl-3-(1-methylethenyl)	204	$C_{15}H_{24}$	
9	alpha.-Guaiene	204	$C_{15}H_{24}$	
10	Naphthalene,1,2,3,4,4a,5,6,8a-octahydro-4a	204	$C_{15}H_{24}$	

GC-MS Analysis of Hexane Extract of Black Pepper

Table 4 showed the molecular weight, molecular formula and chemical structure in Hexane Extract of Black Pepper Revealed by GC-MS Analysis. The result revealed that l-(+)-Ascorbic acid (652 g/mol) have the highest molecular weight followed by 2,2,4-Trimethyl-3-(3,8,12,16-tetramethyl (428 g/mol.), Heptadecanoic acid (298 g/mol.), 9-octadecenoic acid (Z)-g/mol.), 3,7,11,15-Tetramethyl-2-hexadecen-1-ol and 9-octadecenoic acid (Z)- (296 g/mol.) each, Piperine (285 g/mol.), Octadecanoic acid (284 g/mol), Oleic Acid (282 g/mol.) and 9,12-Octadecadienoic acid (Z,Z)- (280 g/mol.). the present finding seem to be consistent with Akash and Nawal (2018) who reported that the bioactivity of the compound depend on the concentration of the compound which he attributed it to high molecular weight. Most of these constituents have been found to show interesting biological activity against certain insect pest, illnesses and pathogens. For instance, the anti-inflammatory Aparna *et al.* (2012) antioxidant,

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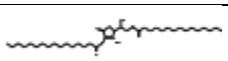
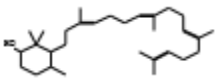
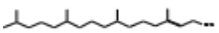
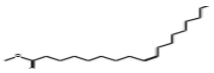
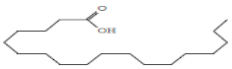
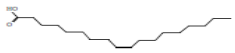
hypocholesterolemic Kumar *et al*. (2010) antibacterial Rahuman *et al*. (2000) activities reported for n-hexadecanoic acid, may suggest the rationale for the traditional use of the species. Parasuraman *et al.* (2009) identified 17 compounds with n- Hexadecanoic acid and Octadecanoic acid as the major compounds in the leaves of *Cleistanthus collinus.*

Table 4: Chemical Composition, Molecular Weight, Molecular formula and Chemical Structure of Hexane Extract of Black Pepper Revealed by GC-MS Analysis

S/N	Compound Name	Molecular Weight	Molecular formula	Chemical Structure
1	l-(+)-Ascorbic acid	652	$C_{38}H_{68}O_8$	
2	2,2,4-Trimethyl-3-(3,8,12,16-tetramethyl	428	$C_{30}H_{52}O$	
3	Heptadecanoic acid	298	$C_{19}H_{38}O_2$	
4	9-Octadecenoic acid (Z)-,	296	$C_{19}H_{36}O_2$	
5	3,7,11,15-Tetramethyl-2-hexadecen-1-ol	296	$C_{20}H_{40}O$	
6	9-Octadecenoic acid (Z)-,	296	$C_{19}H_{36}O_2$	
7	Piperine	285	$C_{17}H_{19}NO_3$	
8	Octadecanoic acid	284	$C_{18}H_{36}O_2$	
9	Oleic Acid	282	$C_{18}H_{34}O_2$	
10	9,12-Octadecadienoicacid (Z,Z)-	280	$C_{18}H_{32}O_2$	

GC-MS Analysis of Mentholated Spirit Extract of Pawpaw Seeds

Table 5 showed the Molecular Weight, Molecular formula and Chemical Structure of Mentholated Spirit Extract of Pawpaw Seeds. The result showed that stearic acid (578 g/mol.) followed by gamma.-Sitosterol (414 g/mol.) Ethyl Oleate (310 g/mol.), Oleoyl chloride (300 g/mol.) 9-Octadecenoic acid and 10-Octadecenoic acid having (296 g/mol.) each, Piperine (285 g/mol.), Hexadecanoic acid (270 g/mol.), 6-Ethyl-3-trimethylsilyloxydecane (258 g/mol.) and n-Hexadecanoic acid (256 g/mol). The intensity in the spectrum depends on the molecular structure and, particularly, their ability to delocalize (stabilize) the positive charge, which allow the ion to exit for longer time than is require for its detection in a mass spectrometer.

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GC-MS Analysis of Hexane Extract of Pawpaw Seeds

Table 6 revealed the molecular weight, molecular formula and chemical structure of hexane extract of pawpaw seeds. The compounds with the highest molecular weight were result 1,1,6-trimethyl-3-methylene-2-(3,6,9,13-tetramethyl (452 g/mol.) followed by Cholestan-3-one, 4,4-dimethyl- (414 g/mol.), Urs-12-ene (410 g/mol.), 2H-Benzo[f]oxireno[2,3-E]benzofuran (399 g/mol.), 1-Decanol,8-[(trimethylsilyl)oxy]- (342 g/mol.), 9-Octadecenoic acid, methyl ester, (E)- (292 g/mol.), 9,12-Octadecadienoic acid, methyl ester (294 g/mol.), Piperine (285 g/mol.), Octanoic acid (285 g/mol.) and 6-Octadecenoic acid (282 g/mol.). The highest molecular weight obtained in these compounds is an indication of higher bioactivity. Many reports in the literature have shown that cyclopeptides from laticiferous plants have been isolated from the ethylacetate fraction. Thus, considering that this fraction was cytotoxic and anti-inflammatory and reacted positively for amide groups, it was re-examining during ninhydrin. Sharma *et al.* (2016) pointed out that the medicinal importance of these compounds identified supports that the plant has much and different pharmaceutical and pesticide value.

Table 5: Chemical Composition, Molecular Weight, Molecular formula and Chemical Structure of Mentholated Spirit Extract of Pawpaw Seeds Revealed by GC-MS Analysis

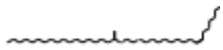
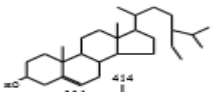
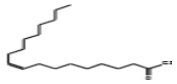
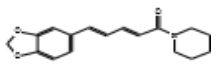
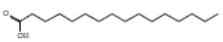
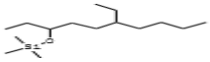
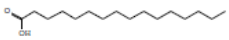
S/N	Compound Name	Molecular Weight	Molecular formula	Chemical Structure
1	Stearic acid	578	$C_{38}H_{74}O_3$	
2	gamma.-Sitosterol	414	$C_{29}H_{50}O$	
3	Ethyl Oleate	310	$C_{20}H_{38}O_2$	
4	Oleoyl chloride	300	$C_{18}H_{33}ClO$	
5	9-Octadecenoic acid	296	$C_{19}H_{36}O_2$	
6	10-Octadecenoic acid	296	$C_{19}H_{36}O_2$	
7	Piperine	285	$C_{17}H_{19}NO_3$	
8	Hexadecanoic acid	270	$C_{17}H_{34}O_2$	
9	6-Ethyl-3-trimethylsilyloxydecane	258	$C_{15}H_{34}OSi$	
10	n-Hexadecanoic acid	256	$C_{16}H_{32}O_2$	

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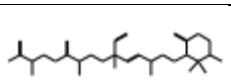
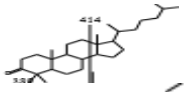
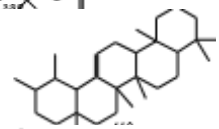
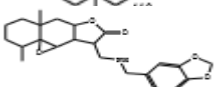
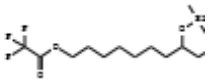
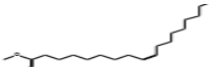
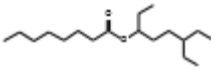
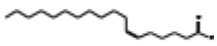
Table 6: Chemical Composition, Molecular Weight, Molecular formula and Chemical Structure of Hexane Extract of Pawpaw seeds Revealed by GC-MS Analysis

S/N	Compound Name	Molecular Weight	Molecular formula	Chemical Structure
1	1,1,6-trimethyl-3-methylene-2-(3,6,9,13-tetramethyl	452	$C_{33}H_{56}$	
2	Cholestan-3-one, 4,4-dimethyl-	414	$C_{29}H_{50}O$	
3	Urs-12-ene	410	$C_{30}H_{50}$	
4	2H-Benzo[f]oxireno[2,3-E]benzofuran	399	$C_{23}H_{29}NO_5$	
5	1-Decanol,8-[(trimethylsilyl)oxy]-,	342	$C_{15}H_{29}F_3O_3Si$	
6	9-Octadecenoic acid, methyl ester, (E)-	296	$C_{19}H_{36}O_2$	
7	9,12-Octadecadienoic acid, methyl ester	294	$C_{19}H_{34}O_2$	
8	Piperine	285	$C_{17}H_{19}NO_3$	
9	Octanoic acid	284	$C_{18}H_{36}O_2$	
10	6-Octadecenoic acid	282	$C_{18}H_{34}O_2$	

CONCLUSION AND RECOMMENDATION

Phytochemical screening and GC-MS analysis of metylated sprit and hexane extract in seeds of black pepper and pawpaw seeds revealed the presence of secondary metabolites of pesticide anticancerous, antimicrobial, antioxidant, antidandruff, antiproliferative activities and provides a potential source of industrial application. It was therefore, concluded that the biological values of black pepper and pawpaw seeds contain pesticide and pharmacological active compounds that may enhance its use as a traditional drug and pesticide. The study recommended the Methylated sprit as a best solvent for the extraction of bioactive compounds in black pepper and pawpaw seeds.

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