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GC-MS of *Allium sativum* (Garlic) and *Gongronema latifolium* (Utazi*)* plant extracts and inhibition of post-harvest fungi in cocoyam

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Abstract The research elaborated the significantly used the Gas Chromatography-Mass Spectrometry Analysis technique for detecting the phytochemical constituents in *Allium sativum* (Garlic) and *Gongronema latifolium* (Utazi) extracts that made them a good potent antifungal activity and useful for quality control. The phytochemical constituents of *G. latifolum* are identified as phytol, phthalic acid, oleic acid, octasiloxane and octadecadienol while Benezeneacetaldehyde, Diallyldisulphide, Disulfane, p-Benzoquinone and Octanoic acid were found in *A. sativum*. The presence of these compounds justified the use of some plant parts for various elements in antifungal and can be advised as a plant of phytopharmaceutical and industrial importance. UV-VIS techniques were assessed the UV visibility in *G. latifolium* extract. The absorption peaks of plant extracts' UV-VIS spectra were shown to be 202, 204, 209, 224, 226, 228, 230, 234, 236, 238, 241, 282, 404, 503, 535, 608 and 666 nm, with absorption values of 10.000, 10.000, 5.449, 10.000, 5.635, 6.771, 5.671, 10.000, 10.000, 6.524, 10.000, 10.000, 0.814, 0.098, 0.085, 0.075 and 0.292, respectively while UV-VIS profile of *A. sativum* extract was collected at wavelengths ranging from 202 to 281 nm. Peaks were seen at 202, 205, 214, 217, 220, 222, 227, 230, 233, 236, 238, 247, 250, 254, 256, 259, 261, 264, 266, 269, 274, 276, 278 and 281 nm with absorption values of 4.694, 4.596, 10.000, 10.000, 5.013, 4.936, 4.573, 4.623, 4.647, 4.704, 4.666, 5.076, 6.038, 10.000, 10.000, 10.000, 10.000. 5.682, 5.494, 6.553, 10.000, 10.000, 10.000 and 5.447 respectively. The antifungal activities of these plant extracts were expressed to inhibit *Aspergillus niger, Penicillium citrinum, Fusarium solani, Rhizopus stolonifera,* and *Mucor piriformis* isolated from stored cocoyam tubers.

Keywords: Bioactive compound, Garlic, GC-MS, Utazi

Introduction

GC/MS is limited to analyse not only volatile and thermally liable but also the harsh partitioning conditions of the gas chromatograph. GC-MS has been used for the analysis of biological samples for several decades. One of the most common applications of GC-MS is drug testing for clinical or forensic purposes

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(Soro *et al*., 2016). Many drugs have found to be relatively low molecular weight, and nonpolar and/or volatile properties, making these compounds particularly suitable for analysis by GC. One important limitation to GC-MS is the requirement that compounds have sufficiently volatiles to transfer from the liquid phase to the mobile carrier gas, and thus to elute from the analytical column to the detector (Ginsberg *et al.,* 2016). Despite its limitation, GC-MS has several positively attributed. High-efficiency separations have been achieved with numerous commercial capillary columns. This technique allows to achieve high-efficiency chromatographic separation and excellent limits of quantification, and it allows for usingcommercial mass spectral libraries for identification of sample constituents (Hoofnagle, 2018).

The GC/MS equipment separates chemical mixtures (GC component) and recognizes the components at the molecular level (MS component). The GC operates under the premise that heating a mixture causes it to split into distinct compounds (Turner *et al*., 2020). A column of hot gases and an inert gas are conveyed through it such as helium. The separated materials flow into the MS when they leave the column aperture. Compounds are identified by mass spectrometry based on the molecular weight of the sample. Complex chemical mixtures can be separated, identified, and quantified using the gas chromatography mass spectrometry (GC/MS) technology, which consists of a gas chromatograph (GC) connected to a mass spectrometer (MS). Due to its ability to separate chemical mixtures (GC component). Gas chromatography/Mass spectrometry (GC/MS) apparatus has perfect lyanalysedthe hundreds of relatively low molecular weight chemicals prevalent in environmental materials (Bünning *et al*., 2021). A chemical must be found to be sufficiently volatile and thermally stable to be analysed by GC/MS. Plant extracts must first be extracted by solvent and then exposed to different "wet chemical" procedures before GC/MS analysis (Pasternak *et al*., 2022).

The carrier gas vaporises the sample solution when it is fed into the GC inlet and sweeps it onto a chromatographic column (usually helium). The chemicals in the mixture of interest are separated as the sample passes through the column due to their respective interactions with the column's coating (stationary phase) and the carrier gas (mobile phase) (Narciso *et al.*, 2019). The heated transfer line that the column goes through in its last section is where chemicals that elute from the column are transformed into ions. Gas chromatography (GC) and liquid chromatography (LC) are the two main forms of chromatography. Gas chromatography uses the partitioning of a stationary phase from a gas phase to separate gases (Okigbo *et al*., 2020). Size exclusion (separation based on molecular size), ion exchange (separation based on charge), and high-performance liquid chromatography are examples of methods used in

liquid chromatography (HPLC separation based on partitioning from a liquid phase) (Karlberg *et al*., 2021).

The chemical components of a sample mixture are separated using the separation science method of gas chromatography (GC), which is then used to identify the components to ascertain whether or not they are there, as well as how much of each component is. Although GC alone cannot be utilised to identify unknowns, hyphenation to an MS can be quite effective in this situation. MS is a detector that may be used alone because it is utilised to conduct a 100% specific test that positively detects the presence of a specific chemical, GC-MS has come to be known as the "gold standard" for forensic substance identification. Any of the many chemicals in a category of substances may be detected by a nonspecific test (Clarke *et al*., 2018, Okigbo *et al.,* 2018). Even while a generic test might statistically indicate the substance's identification, this could result in erroneous positive identification. However, thermal degradation of injected molecules may occur as a result of the high temperatures (300°C) utilised in the GC-MS injection port (and oven) (Soro *et al*., 2016), resulting in the detection of degradation products rather than the desired molecule(s).

The aim was to elaborate the significantly usingthis technique to detect the phytochemical/bioactive constituents in *A. sativum* (Garlic) and *G. latifolium* (Utazi) extracts, and to evaluate those metabolites for antifungal activities against selected fungi, *Aspergillus niger, Penicillium citrinum, Fusarium solani, Rhizoous stolonifera,* and *Mucor piriformis* isolated from stored cocoyam tubers.

Materials and methods

Sources of materials

The plant materials were sourced from Eke-Awka, the state capital of Anambra, which has latitude and longitude of 6.12'25^{o}N7.04'04 ^{o}E and 6.20694^{o}N 7.06778 ^{o}E, respectively. These samples will be packed in sterile, moisture-free polythene bags with labels and delivered Multiusers Science Research Laboratory, Ahmadu Bello University Zaria for analysis.

SDA media preparation

About 65g of the medium were suspended and dissolved in 1 litre of distilled water by heating to boiling and stirring frequently. It was heated for one minute to dissolve the solution, and then sterilised for 15 minutes at 121°C in an autoclave. After that, while the solution was still molten, 500mg of the antibiotic streptomycin was added.

Methodology for isolation and identification of post-harvest spoilt cocoyam

In this work, the isolation method from Onuh *et al.,* (2015) was used. The surfaces were sterilised by dipping completely in a concentration of 40% hypochlorite solution for 60 seconds; the sterilised sections to be inoculated were then removed and rinsed with three changes of sterile distilled water. A small section of infected *C. esculenta* tissues containing the advancing margin of rot and adjoining healthy tissue was cut using a sterilised scalpel and cork borer. In a laminar airflow cabinet, the tuber pieces were dried by blotting with sterile filter paper. Ten pieces of each cut sample were individually infected (90° apart) on solidified Potato Dextrose Agar (PDA) and Sabouard Dextrose Agar (SDA) plates with the help of sterile forceps. The paper tapes were used to secure the inoculation plates, and they were then incubated at 28°C–30°C for 72 hours. The inoculation plates were examined for fungi linked to the rotting of the tubers. In order to purify the materials, a sterile inoculating needle was washed in selecting mycelia threads from the samples and then transferred to freshly prepared PDA and SDA plates. The isolates were then subjected to several subcultures for further purification. All of the samples were plated using the pour plate technique (Dhawale and LaMaster, 2003; Chinwendu *et al.,* 2016). Using a sterile pipette, 1 ml of dilution (10-1) (the dilution that is neither too murky nor too light) was added to a 9 ml Petri plate. Each dish received a pour of molten potato dextrose agar (10 ml). To make it simple for the sample and the medium to mix together, the plates were turned clockwise. All plates were left on the bench to set up. The plates were all copied. The entire collection of hardened plates was placed in an incubator set at 25ºC for 3-5 days. Mycelia colonies were counted daily based on observation.

Identification and characterization of fungi

To create a pure culture, isolated fungus was further sub-cultured. According to Marthur and Kongsdal (2013) and De Hoog *et al*. (2020) whose identification was based on colony characteristics, morphology, and microscopic traits (Using morphological traits and matching the results to established keys as given by Nwachukwu and Osuji (2018) fungi were identified. Each isolate was examined using a colony and a microscope, and their morphological characteristics were noted and documented. Based on growth patterns, mycelia colour, and microscopic investigations of vegetative and reproductive structures, morphological traits were explored. A little piece of mycelia was taken from the area between the colony's centre and edge using a sterile inoculating needle, and it was then put on a spotless microscopic slide with lactophenol in cotton blue.

Using the sterile needle and a cover slip that was put carefully and slightly pressed to remove air bubbles, the mycelia were evenly disseminated throughout the slide. The slide was heated by steam from some boiling water in order to better preserve the fungal formations on it. Using sterile blotting paper, the cover slip's excess lactophenol was removed from the margins. Using the microscope's 10 and 40 objective lenses, the slide was examined. To help with the identification of the organisms, the Cultural Characteristics, growth pattern, pigmentation, and size of colonies were noted during the incubation period.

Determination of minimum inhibitory concentration (MIC)

Plant extracts' minimum inhibitory concentrations (MICs) were calculated using a modified microplate approach. Plant extracts were serially diluted, with dilutions ranging from 1/2 to 1/100 of the original amount. Each extract dilution was combined with 100 mL of fungal spore suspension (2 106 spores mL-1 in fresh PDB) in each well. The microplates were incubated at 27 °C for 2-3 days while being checked every day. Three copies of each experiment were performed. A microplate reader set to 595 nm was used to spectrophotometrically read the MIC values. By comparing the growth in control wells and the extract blank, which consisted of uninoculated plates, MIC values were determined. The lowest concentration of plant extract that resulted in growth inhibition of more than 90% after 48 hours when compared to the control was known as the MIC of the extracts (CLSI, 2018). Using MFC, in vitro fungicidal activity (CLSI, 2018). 20 L were subcultured onto PDA plates after 72 hours from each well that had no discernible growth (growth inhibition of > 98%), from the last positive well (growth comparable to the growth control well), and from the growth control (extract-free medium). The plates were incubated at 27 °C until the growth control subculture showed signs of growth. The lowest extract concentration that did not result in any fungus growth on the solid was considered to be the minimum fungicidal concentration used.

Gas Chromatography-Mass Spectrometry analysis

Gas chromatography-mass spectrometry (GC/MS) was used to determine the presence of active components and chemical constituents of plant extracts. Agilent Technologies, 5977, US1447L431, 6.00.21 was used to analyse the extract using GC/MS. At a flow rate of 1 ml/min, helium was used as the carrier gas, and 1L of the sample supernatant was placed inside the GC. The GC oven temperature was programmed to rise from 80°C to 200°C at a rate of 15°C/min, then to 280°C at a rate of 5°C/min, with a 5-min isothermal at 280°C. The

temperature of the ion source was set to 230°C, and the ionization voltage was set to 70 eV

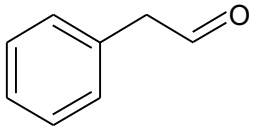
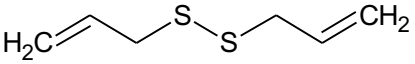
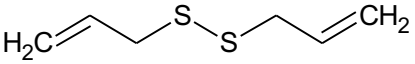
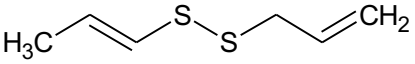
UV-VIS analysis

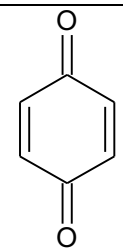
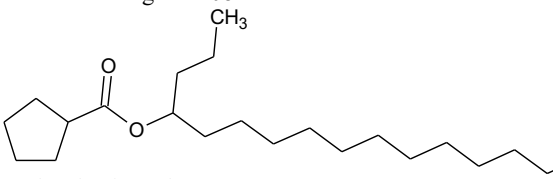
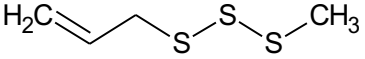
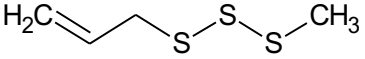
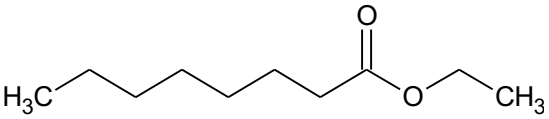
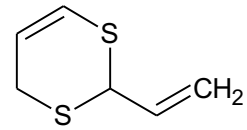
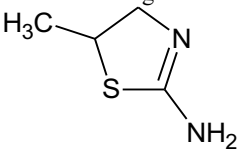
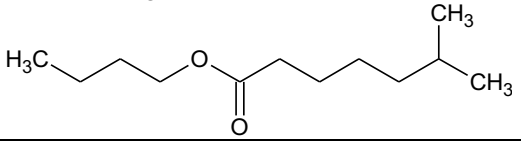
The plant extracts were first centrifuged for 10 minutes at 3000 rpm, filtered, and then the filtrate was diluted in the same extraction solvent at a ratio of 1:10 with the extract. The various peaks were located by scanning the extract at wave lengths between 200 and 800 nm with a Perkin Elmer Spectrophotometer. Peak UV-VIS values were noted.

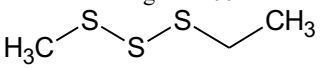
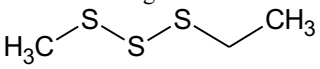
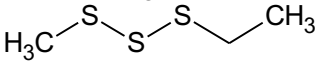
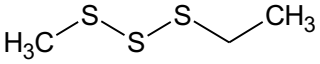
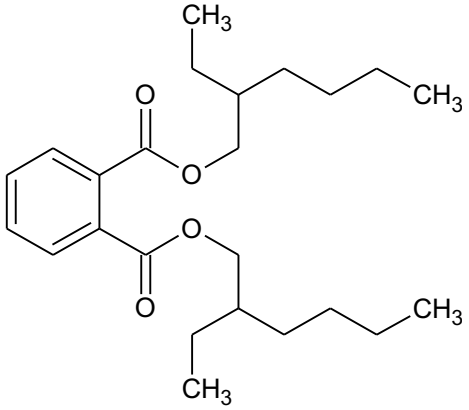
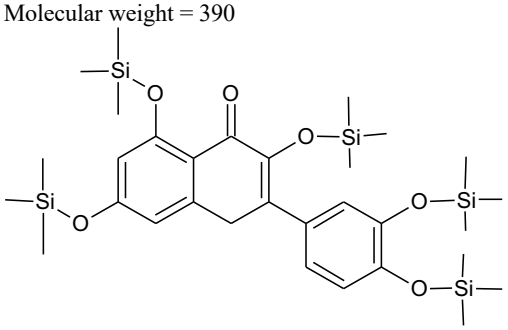
Results

The GC-MS analysis of the garlic extract (*Allium sativum*) revealed that Trisulfide, di-2-propenyl had the biggest peak area (19.44%) and was the most significant compound among the detected compounds, whereas 2-Vinyl-4H-1,3-dithiine showed the lowest peak area (0.72%) and was the most minor compound (Table) 1.

Table 1. Bioactive chemical constituents (GCMS) present in the extract of garlic

S/N	RT	NAME OF COMPOUNDS	STRUCTURE MOLECULAR WEIGHT MOLECULAR FORMULA	PEAK AREA %
1	5.5794	Benzeneacetaldehyde	 Molecular weight = 120 Molecular formula: C_8H_8O	1.63
2	6.1177	Diallyldisulphide	 Molecular weight = 146 Molecular formula: $C_6H_{10}S_2$	2.21
3	6.1934	Diallyldisulphide	 Molecular weight = 146 Molecular formula: $C_6H_{10}S_2$	4.94
4	6.6477	(Z)-1-Allyl-2-(prop-1-en-1-yl)disulfane	 Molecular formula: $C_6H_{10}S_2$ Molecular weight = 146	1.85

5	6.8952	p-Benzoquinone	 Molecular formula: $C_6H_4O_2$ Molecular weight = 108	2.30
6	7.1735	Cyclopentanecarboxylic acid, 4-hexadecyl ester	 Molecular formula: $C_{22}H_{42}O_2$ Molecular weight = 338	0.80
7	7.4873	Trisulfide, methyl 2-propenyl	 Molecular formula: $C_4H_8S_3$ Molecular weight = 152	14.50
8	7.6487	Trisulfide, methyl 2-propenyl	 Molecular formula: $C_4H_8S_3$ Molecular weight = 152	3.81
9	9.0051	Octanoic acid, ethyl ester	 Molecular formula: $C_{10}H_{20}O_2$ Molecular weight = 172	0.91
10	9.2828	2-Vinyl-4H-1,3-dithiine	 Molecular formula: $C_6H_8S_2$ Molecular weight = 144	0.72
11	9.3734	Thiazole, 2-amino-4,5-dihydro-5-methyl-	 Molecular formula: $C_6H_8S_2$ Molecular weight = 144	7.14
12	9.6860	Butyl 6-methylheptanoate		4.20

			Molecular formula: $C_{12}H_{24}O_2$ Molecular weight = 200	
13	11.5350	Trisulfide, di-2-propenyl	 Molecular formula: $C_3H_8S_3$ Molecular weight = 140	19.44
14	11.8367	Trisulfide, di-2-propenyl	 Molecular formula: $C_3H_8S_3$ Molecular weight = 140	15.41
15	11.9037	Trisulfide, di-2-propenyl	 Molecular formula: $C_3H_8S_3$ Molecular weight = 140	13.28
16	18.014	Tetrasulfide, di-2-propenyl	 Molecular formula: $C_3H_8S_3$ Molecular weight = 140	2.12
17	37.6684	Bis(2-ethylhexyl) phthalate	 Molecular formula: $C_{24}H_{38}O_4$ Molecular weight = 390	2.73
18	41.8073	Quercetin, 5TMS derivative	 Molecular formula: $C_{31}H_{52}O_6Si_5$ Molecular weight = 661	2.07

The qualitative UV-VIS profile of *Allium sativum* (garlic) extract which was collected at wavelengths ranging from 202 to 281 nm. Peaks were seen at 202, 205, 214, 217, 220, 222, 227, 230, 233, 236, 238, 247, 250, 254, 256, 259,

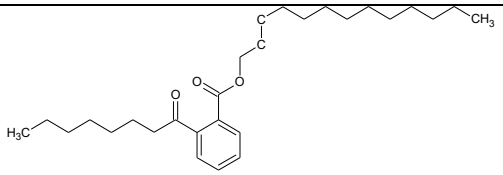
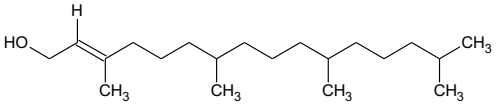
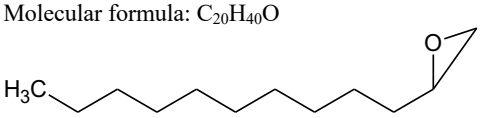
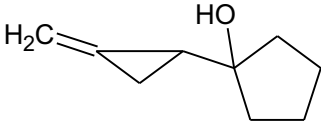
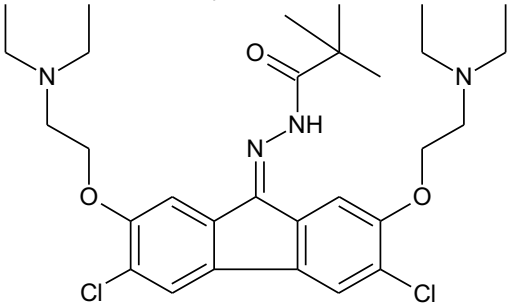
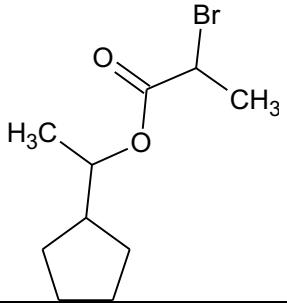
261, 264, 266, 269, 274, 276, 278 and 281 nm with absorption values of 4.694, 4.596, 10.000, 10.000, 5.013, 4.936, 4.573, 4.623, 4.647, 4.704, 4.666, 5.076, 6.038, 10.000, 10.000, 10.000, 10.000. 5.682, 5.494, 6.553, 10.000, 10.000, 10.000 and 5.447 respectively (Table 2).

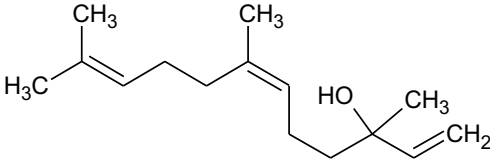
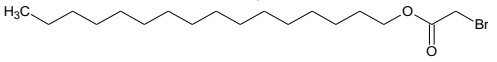
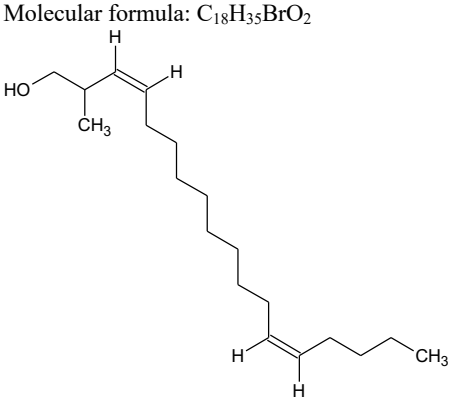
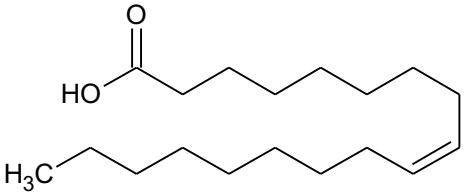
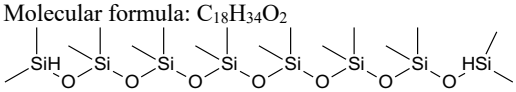
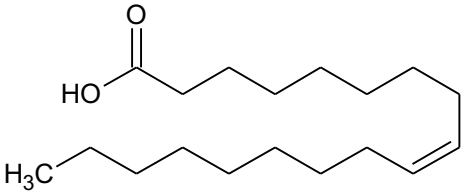
Table 2. UV-VIS Peak values of extract of Garlic

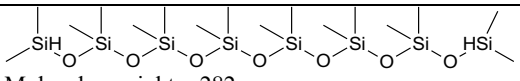
S/N	Wavelength (nm)	Absorbance
1	202	4.694
2	205	4.596
3	214	10.000
4	217	10.000
5	220	5.013
6	222	4.936
7	227	4.573
8	230	4.623
9	233	4.647
10	236	4.704
11	238	4.666
12	247	5.076
13	250	6.038
14	254	10.000
15	256	10.000
16	259	10.000
17	261	10.000
18	264	5.682
19	266	5.494
20	269	6.553
21	274	10.000
22	276	10.000
23	278	10.000
24	281	5.447

GC-MS analysis of the *Gongronema latifolium* extract which revealed that Phytol had the biggest peak area (52.27%) and was the most significant compound among the detected compounds, whereas Oleic Acid showed the lowest peak area (0.97%) and was the most minor compound (Table 3).

Table 3. GC-MS analysis of *Gongronema latifolium* extract

S/N	RT	Name of compound	Structure Molecular Weight Molecular Formula	Peak Area %
1	27.4381	Phthalic acid, isohexyltridec-2-yn-1-yl ester	 Molecular weight = 426 Molecular formula: $C_{28}H_{42}O_3$	7.93
2	30.3014	Phytol	 Molecular weight = 296.5 Molecular formula: $C_{20}H_{40}O$	52.27
3	30.4767	Oxirane, decyl-	 Molecular weight = 184 Molecular formula: $C_{12}H_{24}O$	3.89
4	31.2719	Cyclopentanol, 1-(methylenecyclopropyl)-	 Molecular weight = 138 Molecular formula: $C_9H_{14}O$	3.52
5	37.6797	9-(2',2'-Dimethylpropanoilhydrazono)-3,6-dichloro-2,7-bis-[2-(diethylamino)-ethoxy]fluorine	 Molecular weight = 557.56 Molecular formula: $C_{30}H_{42}Cl_2N_4O_3$	5.14
6	41.3528	2-Bromopropionic acid, 1-(cyclopentyl)ethyl ester		4.46

			Molecular weight = 249 Molecular formula: $C_{10}H_{17}BrO_2$	
7	41.765	Nerolidol		7.34
			Molecular weight = 222 Molecular formula: $C_{12}H_{26}O$	
8	41.906	Bromoacetic acid, hexadecyl ester		2.16
			Molecular weight = 363 Molecular formula: $C_{18}H_{35}BrO_2$	
9	42.046	2-Methyl-Z,Z-3,13-octadecadienol		2.85
			Molecular weight = 280.5 Molecular formula: $C_{19}H_{36}O$	
10	42.272	Oleic Acid		5.64
			Molecular weight = 282 Molecular formula: $C_{18}H_{34}O_2$	
11	42.359	Octasiloxane, 1,1,3,3,5,5,7,7,9,9,11,11,13,13,15,15-hexadecamethyl-		2.26
			Molecular weight = 282 Molecular formula: $C_{16}H_{50}O_7Si_8$	
12	42.453	Oleic Acid		0.97
			Molecular weight = 282 Molecular formula: $C_{18}H_{34}O_2$	

13	42.5 439	Octasiloxane, 1,1,3,3,5,5,7,7,9,9,11, 11,13,13,15,15- hexadecamethyl-	 Molecular weight = 282 Molecular formula: $C_{16}H_{50}O_7Si_8$	1.57

UV-VIS analysis was identified the phytoconstituents presented in *Gongronema latifolium* extract. The absorption peaks of this plant extract's UV-VIS spectra were at 202, 204, 209, 224, 226, 228, 230, 234, 236, 238, 241, 282, 404, 503, 535, 608 and 666 nm, with absorption values of 10.000, 10.000, 5.449, 10.000, 5.635, 6.771, 5.671, 10.000, 10.000, 6.524, 10.000, 10.000, 0.814, 0.098, 0.085, 0.075 and 0.292, respectively (Table 4).

Table 4. The UV-VIS analysis to identify the phytoconstituents present in *Gongronema latifolium* extract

S/N	Wavelength (nm)	Absorbance
1	202	10.000
2	204	10.000
3	209	5.449
4	224	10.000
5	226	5.635
6	228	6.771
7	230	5.671
8	234	10.000
9	236	10.000
10	238	6.524
11	241	10.000
12	282	10.000
13	404	0.814
14	503	0.098
15	535	0.085
16	608	0.075
17	666	0.292

Discussion

The plant species in the genus *Allium* are interesting sources of chemicals with significant pharmacological and commercial characteristics according to the GCMS data. The effectiveness of garlic against many gram-positive, gram-negative, and acid-fast bacteria has been demonstrated more recently. It has been shown that garlic inhibits both potentially pathogenic enterobacteria and good gut microflora differently (Takashima *et al.,* 2017). Allicin is frequently cited as the cause of garlic's antibacterial properties. After crushing the garlic bulb, the enzyme allinase is released, which leads to the production of allicin. Allicin is then transformed into alliin, and because allicin is an extremely unstable

chemical, it undergoes reactions suddenly to create components that are derivatives of sulphur (Tran *et al.,* 2015). When vancomycin was combined with other substances, an inhibitory synergism was noticed (Ushijima *et al.,* 2018, Okigbo and Anyaegbu, 2021). Garlic cloves and ginger rhizomes may be utilised to prevent drug-resistant microbial illnesses after being extracted with 95% ethanol and shown to have antibacterial action against multi-drug clinical pathogens. The GC-MS analysis of the garlic extract (*Allium sativum*) revealed the presence of thirteen (13) chemicals represented by eighteen (18) peaks. Trisulfide, di-2-propenyl had the biggest peak area (19.44%) and was the most significant compound among the detected compounds, whereas 2-Vinyl-4H-1,3-dithiine showed the lowest peak area (0.72%) and was the most minor compound. Other major compounds identified were Trisulfide, methyl 2-propenyl (14.50 %), Thiazole, 2-amino-4,5-dihydro-5-methyl- (7.14), Diallyldisulphide (4.94 %), and Butyl 6-methylheptanoate (4.20 %) and other minor compounds identified were Cyclopentanecarboxylic acid, 4-hexadecyl ester (0.80), Octanoic acid, ethyl ester (0.91 %), Benzene acetaldehyde (1.63 %) and (Z)-1-Allyl-2-(prop-1-en-1-yl) disulfane (1.85 %). In addition, Quercetin, 5TMS derivative, p-Benzoquinone and Bis (2-ethylhexyl) phthalate have peak area of 2.07 %, 2.30 % and 2.73 % respectively

Trisulfide, di-2-propenyl was found in garlic of the Kastamonu variety. di-2-propenyltrisulfide, allyltrisulfide, and diallyltrisulfide are some of it other names. Trisulfide, di-2-propenyl has been found to have anticancer properties, and its efficacy on preventing dimethylhydrazine-induced colon cancer has also been studied (Keles *et al*., 2014).The Thiazole, 2-amino-4,5-dihydro-5-methyl- is one of the 2-aminothiazole-based derivatives with a methyl group at position 5.The derivatives' structural modifications have been linked to a variety of biological actions, including anticancer, antiviral, antibacterial, anti-prion, psychoactive, anti-allergic, and anti-hypertensive, drawing the interest of medicinal chemists (Elsadek *et al*., 2021).

Researchers have discovered that the volatile sulphur compound diallyl disulfide, which is derived from the garlic plant and has been used as an ingredient in anti-atherosclerotic drugs, has an impact on lipid metabolism and potential pathways in HepG2 cells that are activated by lipopolysaccharides (LPS) (Weng *et al.,* 2017). Another study found that dialyl disulfide can stop the development of doxorubicin-induced nephropathy (Lin *et al.,* 2019). In crushed garlic in oil, the organosulfur phytochemical 2-vinyl-4H-1,3-dithiin has been discovered. It has been investigated as a preventive for cardiovascular disease and as an antioxidant that lowers the incidence of colon and stomach cancer (Palapala *et al.,* 2014).

Octanoic acid, ethyl ester, also called ethyl octanoate, is a chemical that may be used as a flavouring or to create fragrances. It has a distinct fruit and floral aroma and flavour. In some circumstances, it serves as a cleaning agent. Perfumes and polymers have been produced using benzene acetaldehyde, also known as phenylacetaldehyde. Additionally, it is said to have antibacterial properties (Bernard *et al*., 2015). A flavonoid called quercetin has antioxidant and anti-inflammatory effects that may help decrease swelling, eliminate cancer cells, control blood sugar, and stave against heart disease (Kosti´c *et al.,* 2016). It has been discovered that human blood contains p-benzoquinone, also known as 1,4-benzoquinone, which may beemployed to determine the exposure to benzene and its derivatives (Karlberg *et al*., 2021).

Garlic has a large number of phytocompounds, which may be the reason it is employed in traditional medicine to cure a wide range of ailments. It is important to isolate individual components and put them to biological processes, which will undoubtedly produce beneficial outcomes. The findings suggest that Allium sativum includes a variety of bioactive substances. As a result, it is suggested as a plant with potential for use in phytomedicine. Additionally, GC-MS/MS analysis revealed antibacterial components that might be a potential source of food preservation by inhibiting microbial development (Albakain *et al.,* 2017).

Due to the clarity of the peaks and suitable baseline, the qualitative UV-VIS profile of *Allium sativum* (garlic) extract was collected at wavelengths ranging from 202 to 281 nm. Peaks were seen at 202, 205, 214, 217, 220, 222, 227, 230, 233, 236, 238, 247, 250, 254, 256, 259, 261, 264, 266, 269, 274, 276, 278 and 281 nm with absorption values of 4.694, 4.596, 10.000, 10.000, 5.013, 4.936, 4.573, 4.623, 4.647, 4.704, 4.666, 5.076, 6.038, 10.000, 10.000, 10.000, 10.000. 5.682, 5.494, 6.553, 10.000, 10.000, 10.000 and 5.447 respectively. Absorption spectra and the absorption bands of garlic extractdisplay above showed the presence of unsaturated groups, aromatic rings, and heteroatoms such as S, N, and O in the UV-VIS spectra is clearly indicated by the emergence of one or more peaks these ranges (Jain *et al*., 2016).

Medicine has always been derived from plants. They are a source of many potential medications, concentrating mostly on conventional treatments like herbs that are frequently used in folk medicine (Igwe *et al.,* 2015). The extract of *G. latifolium* included many peaks that reflected various chemical types. Peaks in the chromatogram were seen and matched to a database of known component's spectra kept in the GC-MSlibrary. Phytol (52.27 %), Phthalic acid, isohexyltridec-2-yn-1-yl ester (7.93), Nerolidol (7.34 %), Oleic Acid (5.64 %), 9-(2',2'-Dimethylpropanoilhydrazono)-3,6-dichloro-2,7-bis-[2-(diethylamino)-ethoxy]fluorine (5.14 %), and 2-Bromopropionic acid, 1-(cyclopentyl)ethyl ester

(4.46 %) are found to be the major compounds while the minor components include Oxirane, decyl- (3.89), and Cyclopentanol, 1-(methylenecyclopropyl)- (3.52 %),2-Methyl-Z,Z-3,13-octadecadienol (2.85 %),Octasiloxane, 1,1,3,3,5,5,7,7,9,9,11,11,13,13,15,15-hexadecamethyl- (2.26 %), Bromoacetic acid, hexadecyl ester (2.16 %).One of the minor compounds, Octasiloxane, 1,1,3,3,5,5,7,7,9,9,11,11,13,13,15,15-hexadecamethyl-, has been shown to have antioxidative and antibacterial properties (Falowo*et al*., 2017). Oleic acid, which is common in olive oil, is among the fatty acid components found as one primary ingredient (5.64%) in *G. latifolium*. It has been demonstrated that it helps expedite wound healing and that it has beneficial effects on autoimmune, cancer, and inflammatory diseases (Bernard *et al.,* 2017).

2-Methyl-Z, Z-3,13-octadecadienol, a member of the terpenoid chemical class, is found in this plant in small concentrations (2.85%), and it has been suggested that it possesses insecticide, pesticide, pheromone, and herbicide activities (Adeyemi *et al.,* 2017). Citrus peels contain nerolidol, a sesquiterpene alkene alcohol that is one of this plant's primary constituents (7.34%). Nerolidol has antimalarial and antileishmanial effects and is a safe, non-sensitizing substance. It was discovered to have sedative properties, decrease colon adenoma formation in rats, increase the skin penetration of 5-fluorouracil, and stop dermophyte growth in rats (Russo andMarcu, 2017).

Similar to Marine *Streptomyces parvulus*, *G. latifolium* contains 9-(2',2'-Dimethylpropanoilhydrazono)-3,6-dichloro-2,7-bis-[2-(diethylamino)-ethoxy] fluorine (5.14%), which exhibits antibacterial, antioxidant, and cytotoxic properties (Naine *et al.,* 2015). Acyclic diterpene alcohol phytol is widely found in nature and makes up the majority of the components (52.27%) in *G. latifolium*. Anti-inflammatory, anti-hyperalgesic, anti-tumor, anti-fungal, cytotoxic, anti-diabetic, and antibacterial activities are only a few of the health advantages of phytol in humans (Taj *et al.,* 2021).

The spectroscopic technique has developed into a potent and analytical tool for the qualitative and quantitative analysis of pharmaceutical and biological materials, and in this situation, UV-VIS approaches can be used (Kalaichelvi and Dhivya, 2017). Additionally, it has been shown that UV-VIS spectroscopy is a reliable and sensitive method for figuring out the composition of biomolecular (Ginsberg *et al.,* 2016). As a result, UV-VIS techniques were used in this work to assess the UV visibility in *G. latifolium* extract. The absorption peaks of this plant extract's UV-VIS spectra were at 202, 204, 209, 224, 226, 228, 230, 234, 236, 238, 241, 282, 404, 503, 535, 608 and 666 nm, with absorption values of 10.000, 10.000, 5.449, 10.000, 5.635, 6.771, 5.671, 10.000, 10.000, 6.524, 10.000, 10.000, 0.814, 0.098, 0.085, 0.075 and 0.292, respectively.

These wavelengths are distinguished for compounds with π-bonds, σ-bonds and lone pair of electrons, chromophores, and aromatic rings from those without. At absorption of wavelengths 204, 209, 224, 226, 228, 230, 234, 236, 238, 241, 282 nm, the behaviour is due to transitions of N → π* and π → π*, because of the carbonyl group and the unsaturated groups (Oliveira *et al*., 2020).The exact position and relative intensities of the remaining wavelengths provide useful information about the nature of additional phyto components contained in the extract.Gas chromatography–mass spectrometry (GC-MS) is an analytical method that combines the features of gas-chromatography and mass spectrometry to identify different substances within a test sample. Its concise, efficient, automated system gives fast, reproducible and effective results that serve a key role in advancement of Science and Technology. This versatile analytical technique could be explored for better prospects in future. This study has revealed that the crude extracts of *G. latifolium* and *Allium sativum* possess metabolites that suggests its antifungal properties. Therefore, ethanol is recommended for the extraction of the plant materials for subsequent study and evaluation. In view of all the medicinal importance associated with the phytocompounds found in the extract, further investigation should be carried out in order to isolate, identify, characterize and elucidate the structures of these bioactive principles and enhance their potentials for industrial and pharmaceutical utilization.

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