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Evaluation of the Phytochemical Profile of *Ipomoea aquatica* Whole Plant Extract by GC-MS

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***Abstract*:**

The resurgence of interest in natural pharmaceuticals has been driven by the belief that natural medicine is healthier than synthetic medications. Plants, including *Ipomoea aquatica* (*I. aquatica*), are being investigated for their potential as medicinal agents. The study aimed to discover bioactive compounds in the methanolic extract of *Ipomoea aquatica* Whole Plant Extract using gas chromatography and mass spectrometry (GC-MS). *Ipomoea aquatica* is a perennial herb distributed across Ceylon, India, Africa, Tropical Asia, and Australia. The plant's active ingredients, such as flavonoids, tannins, saponins, alkaloids, and terpenoids, have numerous biological features, including anti-diarrhea, anti-inflammatory, anti-ulcer, and anticancer effects. The extract was prepared by macerating the plant material in 500 mL of methanol solution for 8 days at room temperature. The extract was then filtered and collected. The extract solution was reduced to 20 mL by evaporating the solvent at ambient temperature. The GC-MS analysis was used to analyze various compounds. The study highlights the importance of understanding the biological properties of plants in the pharmaceutical industry.

Keywords : GC-MS, *Ipomoea aquatica*, Methanolic extract, Anti-cancer, Convolvulaceae.

1. Introduction:

For thousands of years, knowledge about herbs has been passed down from one generation to the next. The widespread perception that using natural medicine instead of manufactured ones is healthier is primarily responsible for the resurgence of interest in natural pharmaceuticals throughout the past ten years. Numerous cultures utilize plants as medical remedies, and because they contain certain bioactive components that are employed by the pharmaceutical industry, they may be exploited as a source of powerful medications [1]. Many phytochemicals, or secondary metabolites, are found in plants. Because of their additive, synergistic, or individual effects on health, phytochemicals can be used to treat a variety of diseases [2,3]. Phytocompounds are imperative in the pharma industry for the development of innovative drugs and medicinal agents [4]. Finding natural sources of the active components in pharmaceuticals is the first step in the creation of new ones. An innovative technique for locating medicinally active compounds in a variety of plant species is plant extract screening [1,5]. Plant compounds such as flavonoids, alkaloids, saponins, terpenoids and tannins exhibit a multitude of biological properties, such as anti-inflammatory, anti-ulcer, anti-diarrhea, and anticancer activities [5]. In the current age of medication research and novel compound discovery, numerous plant components are assessed according to their conventional use. *Ipomoea aquatica* (*I. aquatica*) (Convolvulaceae), a very useful herb and used as leafy vegetable that is distributed across India and used as food sources and medication sometimes, Africa, Ceylon, Indian subcontinent, Tropical Asia like Indonesia, Bali, Thailand etc., and Australia and that's why it is one of the numerous plants that are being investigated for their potential as medicinal agents [6]. The number of active ingredients in herbs used in the culinary, pharmaceutical, cosmetic, or medical sectors may be ascertained with the use of the GC-MS extract analysis technique [10]. I. aquatica is a tall, prostrate, hollow-stemmed, glabrous perennial plant, with a 3.8–12.5 cm long petiole with rounded or sharp lobes, The leaves are 3.2–7.5 cm in width

and 5–12.5 cm in length. Bracts: linear-lanceolate, small,; pedicels: 2.5–5 cm long; flowers: infundibuliform, clustered or solitary in 3-5 cymes; peduncles: 1.3–10 cm long, frequently containing 1–5 flowers. The blooms consist of a two-celled glabrous ovary with two ovules in each of the cell, five unequal stamens with spiky pollens, and five detached pale purple petals. The fruits are fashioned like capsules, with 1/4 of the seeds enclosed in ovoid, 8 mm long, very slightly pubescent capsules. The seeds have three dimensions: breadth (3.5–4.5 mm), length (4.5–5.5 mm), and thickness (2.5–3.5 mm) [7,8,9]. The objective of this work was to use Gas Chromatography and Mass Spectrometry (GC-MS) to identify the bioactive components in the methanolic extract of *Ipomoea aquatica* Whole Plant Extract.

2. Materials and Methods:

2.1 Collection of Plant Materials:

Ipomoea aquatica was collected in the rural region of Uluberia, Howrah District, West Bengal, India, and identified by Dr. R K Gupta, Scientist- 'E', in the voucher number. CNH/Tech.II/2023/227 at Botanical Survey of India, Central National Herbarium, District- Howrah, Pin- 711103. The Department of Pharmacognosy at Bharat Technology, Uluberia, Howrah, 711316, houses a herbarium of plant species.

2.2 Preparation of extract:

The entire plant of *I. aquatica* was gathered from the wild and weighed around 1.5 kilogram. Then the entire *I. aquatica* plant was thoroughly cleaned to remove undesired particles such as mud and sand. Then they were sliced into smaller pieces and dried for enhanced absorbency. The entire plant material was then prepared to be macerated. Maceration stands out for its simple approach to medicinal plant extracts. It's a fantastic for a wide range of situations, needing little equipment and ability. This gentle technique is especially advantageous for heat-sensitive compounds, maintaining their delicate structures and bioactivities. Furthermore, its broad solvent compatibility enables us to experiment with different polarities, resulting in a wider spectrum of plant constituents and a more comprehensive extract profile. The plant material was then immersed in 500 mL of Methanol solution for nearly 8 days at room temperature in a Volumetric flask lined with aluminum foil. The extracts were then filtered, and the filtrate was collected. Then, 50 ml of Methanolic extract was placed in a small beaker and the extract solution was reduced to 20 ml by simply evaporating the solvent at ambient temperature to make the solution a bit more thick. Then, 10 mL of the solution sample was used in GC-MS to analyze various compounds.

2.3 GC-MS analysis:

The Shimadzu QP 2010 Ultra (Shimadzu, Tokyo, Japan) was utilized in the GC-MS examination of *I. aquatica's* methanol extract. The GC-MS is equipped with an MS, ECD, and FID detector. GC-MS detection was performed using an electron ionization apparatus with an ionization energy of 70 eV that is functioning in the electron impact mode. A split ratio of 1:10 was used to adapt the flow rate of helium (99.999%, AGA Lithuania) carrier gas to 14.1 mL/min with an injection volume of 1.00µl. At 250°C and 200°C, respectively, the injector and ion source temperatures were sustained. The oven temperature was programmed from 70°C (hold for 5 minutes), with an increase of 10°C every minute to 310°C. Mass spectra of particles ranging in size from 45 to 450 Da were obtained at 70 eV using a 0.5 s scan period. The GC/MS run duration was sixty-three minutes, and the solvent delay varied from 0 to 4.5 minutes.

2.4 Identification of phytocomponents:

Determination of mass spectrum of GC-MS analysis was performed on a database of over 62,000 patterns from the Central Instrumentation Laboratory (CUPB) at Ghudda, Bathinda, Punjab. The mass spectra of unknown compounds were compared to that of known compounds present in the NIST library. The test materials' components were identified based on their names, molecular weights (MW), and structures.

3. Results:

The GC-MS chromatogram of the methanolic extract of I. aquatica yielded 23 peaks [Figure 1], showing the presence of phytochemical components. After cross-referencing with the CUPB library's mass spectra, 23 phytocompounds were found, which are pointed down in Table 1. Table 2 shows the mass spectra of all phytochemicals found in the whole plant methanolic extract of I. aquatica.

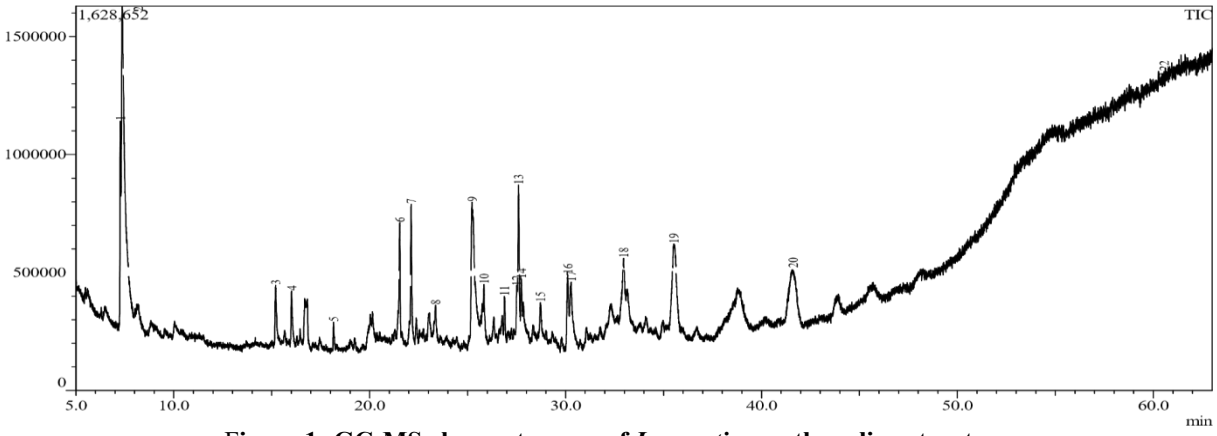
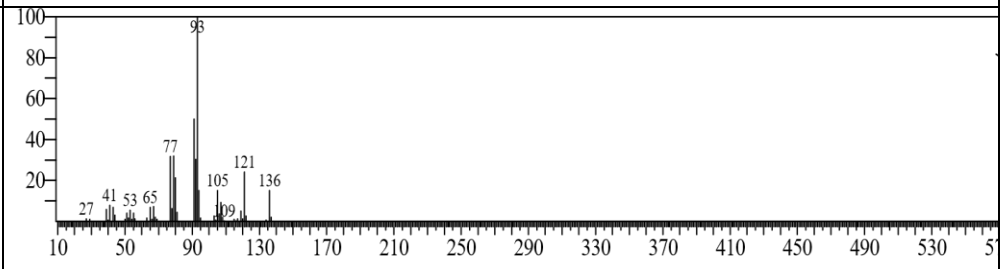
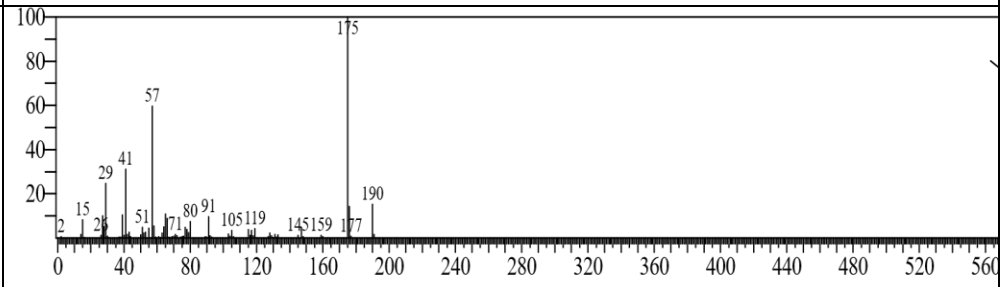
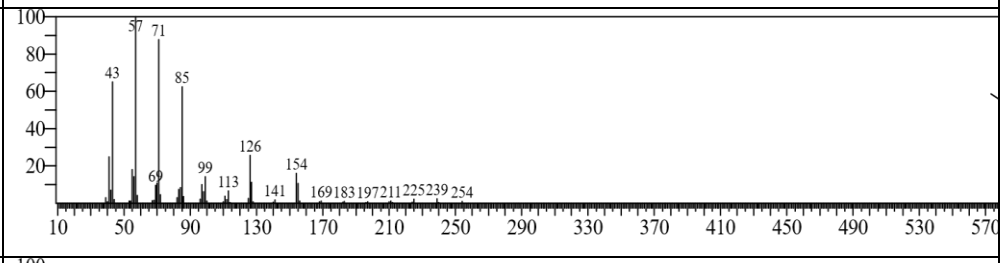
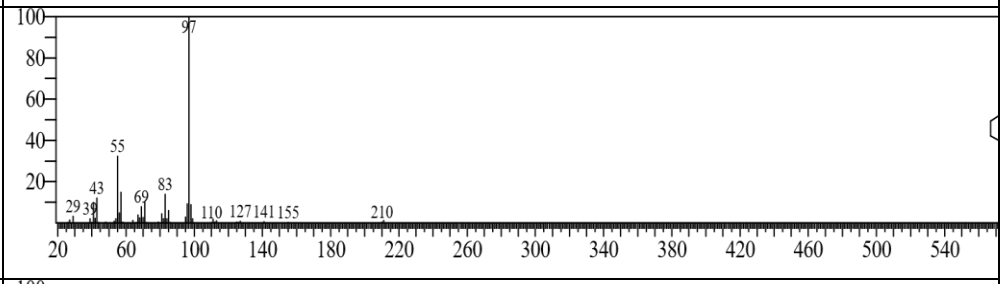
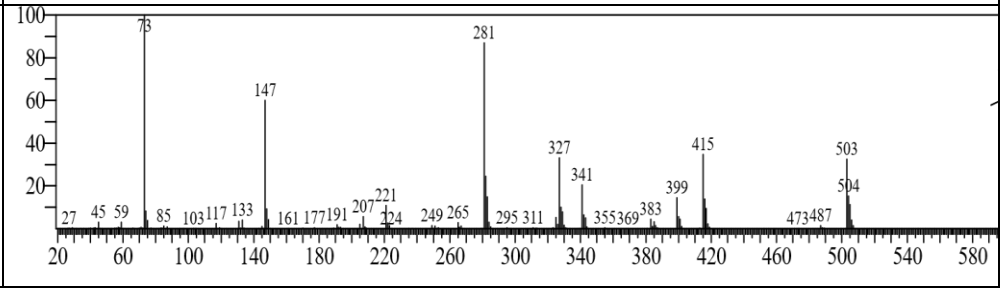


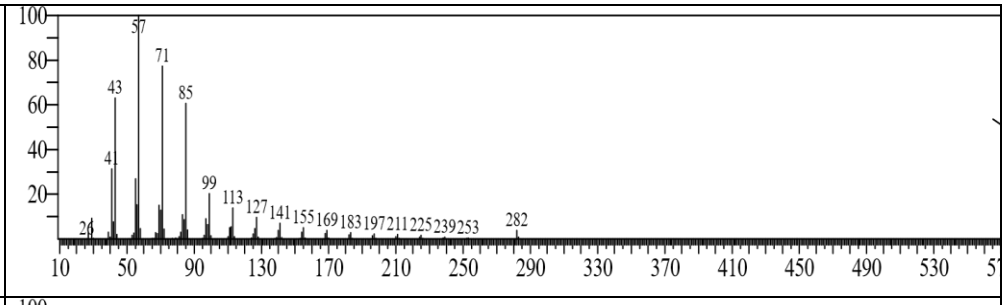
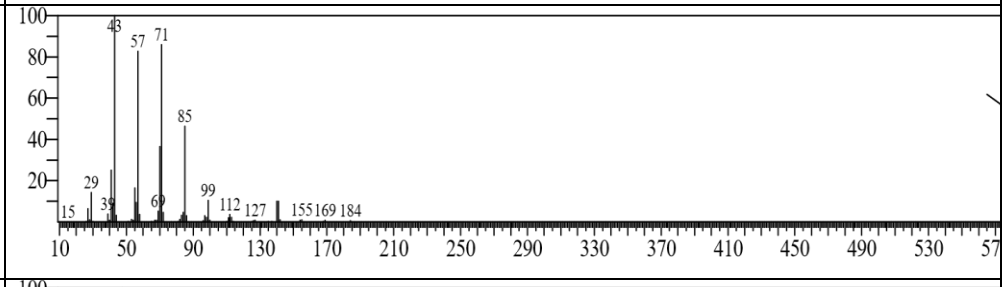
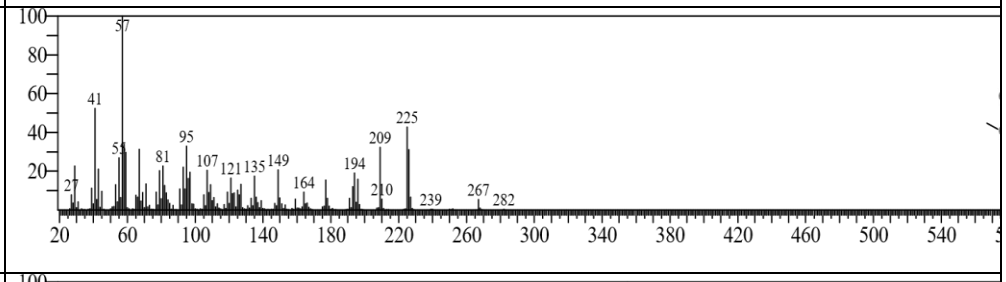
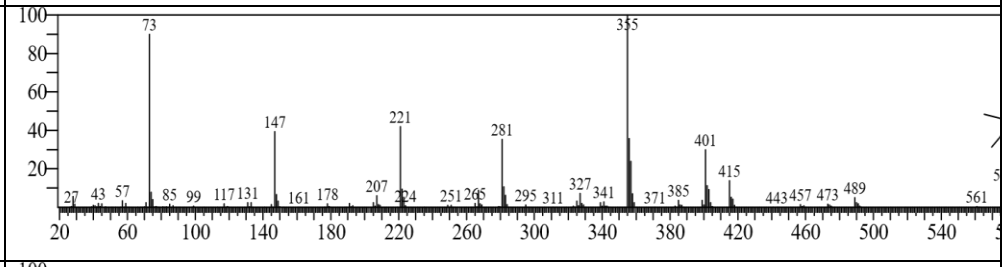
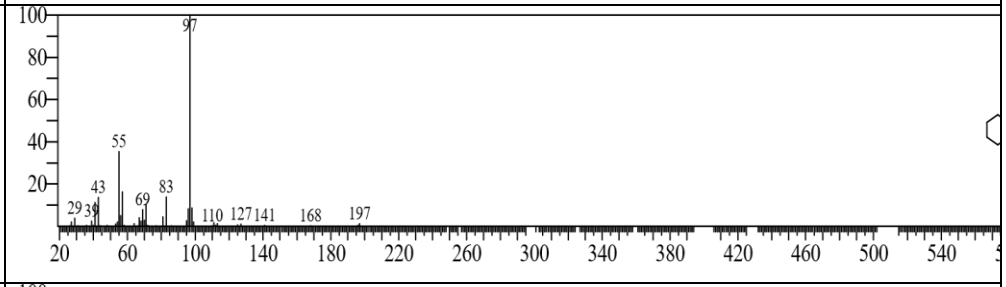
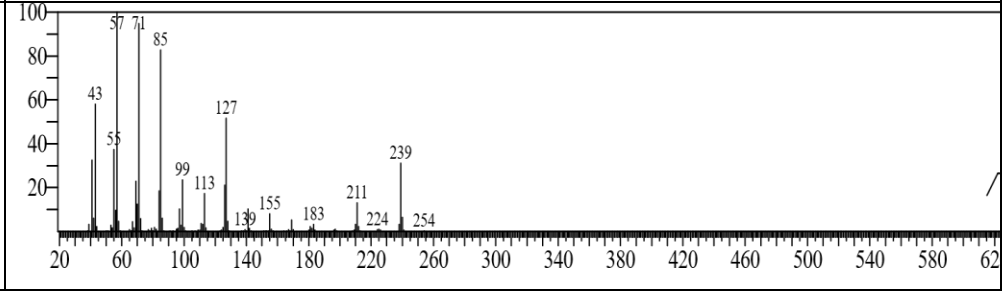
Figure 1: GC-MS chromatogram of *I. aquatica* methanolic extracts.

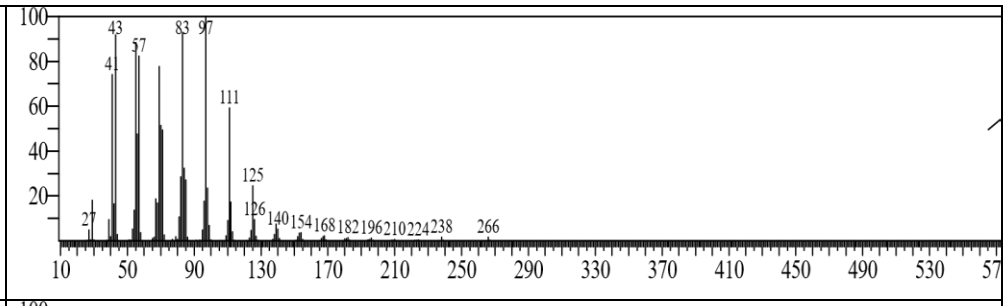
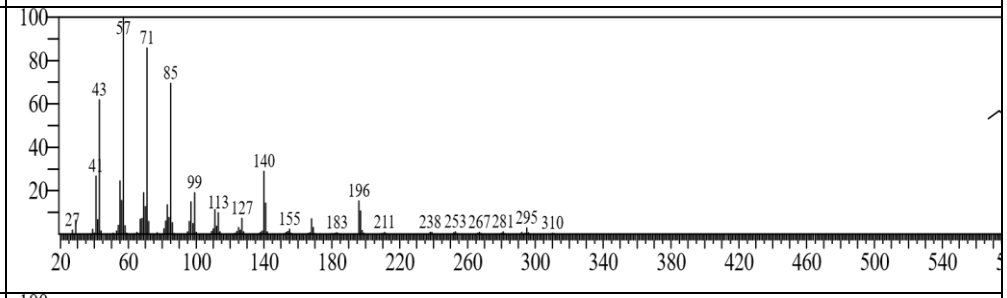
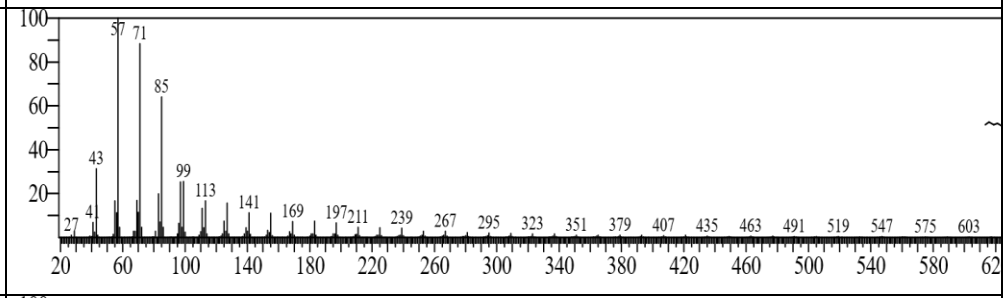
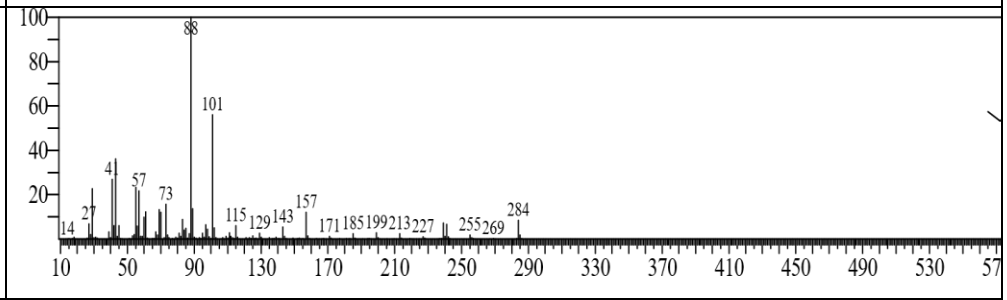
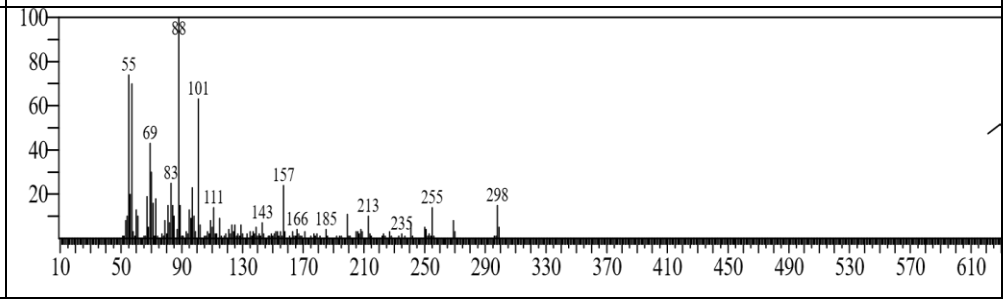
Peak	R. Time	Area %	Name	Formula	MW
1	7.274	5.39	3-Carene	C10H16	136
2	7.369	24.26	3-Carene	C10H16	136
3	15.197	2.21	Benzene, 1,3-bis(1,1-dimethylethyl)-	C14H22	190
4	16.013	2.48	Heptadecane, 8-methyl-	C18H38	254
5	18.161	0.74	Sulfurous acid, cyclohexylmethyl pentadecyl ester	C22H44O3S	388
6	21.532	3.44	Cycloheptasiloxane, tetradecamethyl-	C14H42O7Si7	518
7	22.117	4.34	Eicosane	C20H42	282
8	23.363	0.94	Eicosane	C20H42	282
9	25.23	8.94	Eicosane	C20H42	282
10	25.838	1.03	Cyclooctasiloxane, hexadecamethyl-	C16H48O8Si8	592
11	26.879	1.25	Sulfurous acid, cyclohexylmethyl tetradecyl ester	C21H42O3S	374
12	27.507	1.44	2-(7-t-Butoxy-heptyl)-5-methoxy-cyclopent-2-enone	C17H30O3	282
13	27.597	5.68	Eicosane	C20H42	282
14	27.741	1.3	Dodecane, 4-methyl-	C13H28	184
15	28.716	1.37	5,5-Diethylpentadecane	C19H40	268
16	30.112	2.66	1-Nonadecene	C19H38	266
17	30.279	1.44	9-Methylheneicosane	C22H46	310
18	32.959	1.27	Tetrapentacontane	C54H110	758
19	35.526	15.53	Hexadecanoic acid, ethyl ester	C18H36O2	284
20	41.612	13.58	Ethyl 14-methyl-hexadecanoate	C19H38O2	298
21	60.473	0.26	Isoindol-1-one, 3-hydroxy-2-(4-phenoxyphenyl)-3-phenyl-2,3-dihydro-	C26H19NO3	393
22	60.548	0.2	Isophthalic acid, allyl pentadecyl ester	C26H40O4	416
23	62.243	0.23	1,16-Cyclocorynan-17-oic acid, 19,20-didehydro-2-(20,21-dihydroalstophyllan-18-yl)-2,7-dihydro-, methyl ester, (2.alpha.,7.alpha.,16S,19E)-	C41H50N4O3	646

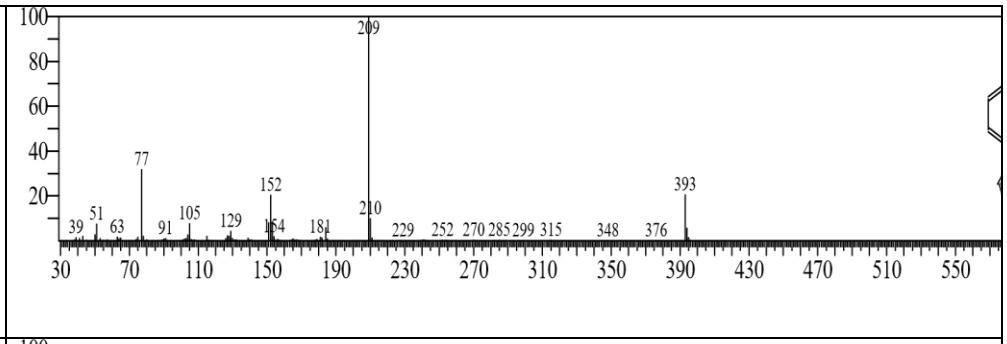
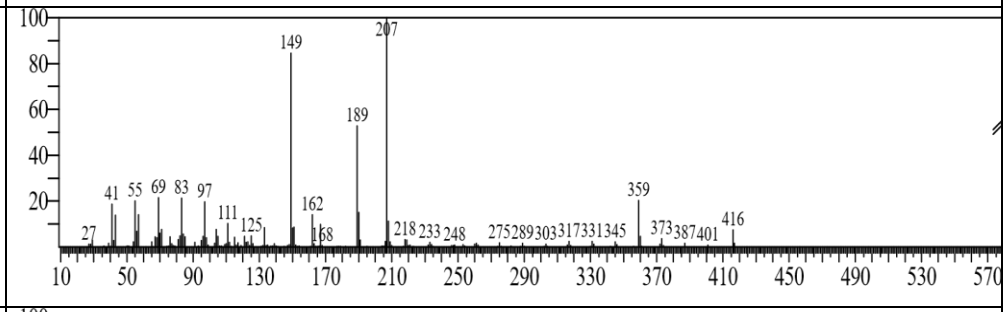
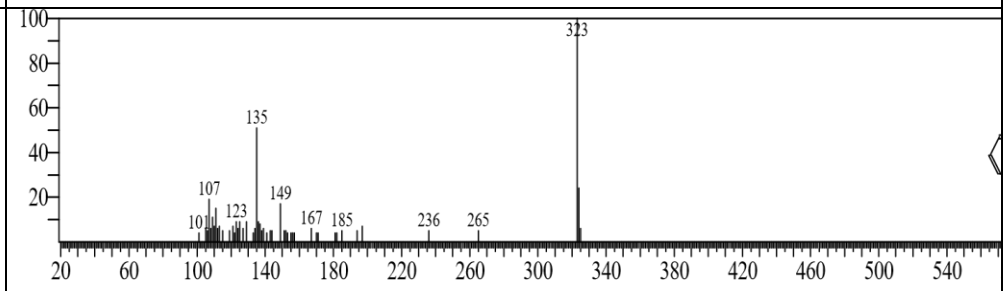
Table 1: Phytochemical analysis of I. aquatica phytocompounds by GC-MS.

Table 2: The Mass Spectrum and the structure of phytocomponents discovered by GC-MS in the methanolic extracts of *I. aquatica*.

Compound Name	Mass spectrum and structure
3-Carene	
Benzene, 1,3-bis(1,1-dimethylethyl)-	
Heptadecane, 8-methyl-	
Sulfurous acid, cyclohexylmethyl pentadecyl ester	
Cycloheptasiloxane, tetradecamethyl-	

Eicosane	
Dodecane, 4-methyl-	
2-(7-t-Butoxy-heptyl)-5-methoxy-cyclopent-2-enone	
Cyclooctasiloxane, hexadecamethyl-	
Sulfurous acid, cyclohexylmethyl tetradecyl ester	
5,5-Diethylpentadecane	

1-Nonadecene	
9-Methylheneicosane	
Tetrapentacontane	
Hexadecanoic acid, ethyl ester	
Ethyl 14-methyl-hexadecanoate	

Isoindol-1-one, 3-hydroxy-2-(4-phenoxyphenyl) -3-phenyl-2,3-dihydro-	
Isophthalic acid, allyl pentadecyl ester	
1,16-Cyclocorynan-17-oic acid, 19,20-didehydro-2-(20,21-dihydroalstophyllan-18-yl)-2,7-dihydro-, methyl ester, (2,alpha.,7, alpha, 16S,19E)-	

4. Discussion:

The GC-MS analysis of methanolic extract *Ipomoea aquatictica* plant extract revealed the presence of 19 phytocompounds, with 3-Carene (29.65%), Eicosane (19.9%), Hexadecanoic acid, ethyl ester (15.53%), Ethyl 14-methyl-hexadecanoate (13.58%), Cycloheptasiloxane, tetradecamethyl- (3.44%), and 1-Nonadecene (2.66%) having higher concentrations than others. It was claimed in many research that 3-carene exhibited a wide range of actions, including antibacterial [11,12,13], antioxidant [12,14,15,16], anticancer [17,18], semiochemical [19,20], and fumigant capabilities [21,22]. And the second highest concentrated compound Eicosane has the wide range of activity including anti-inflammatory, analgesic, antipyretic effect [23]. Hexadecanoic acid has biological action as an antioxidant, hypocholesterolemic, nematicide, and pesticide [24]. Ethyl 14-methyl-hexadecanoate may have use in different usage but have not found any significance research on Pharmacological activity. Cycloheptasiloxane, tetradecamethyl- has a wide range of use as preservative in different sector including food and nutraceutical industry as well as in pharmaceutical industry [25]. 1-Nonadecene has many biological activities

including antiviral and antibacterial and antifungal activity [26]. Other compounds that are present in trace amounts have many biological activities.

5. Acknowledgement:

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