Gas Chromatography Mass Spectrometry Application to Investigate of Phytonutrient Different Parts of Lotus

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***Abstract*—Phytonutrients, also called phytochemicals, are chemicals produced by plants. Foods and vegetables with phytonutrients have antioxidant and anti-inflammatory benefits. The aim of this study was to analyzed 4 parts of 3 lotuses phytochemical constituents by using gas chromatography mass spectrometry. Our results showed that different parts of lotus had a different chemical compound. The major chemical constituents in each extract are 6-Methoxy-2-[p-tolyl]cinchoninic acid (23.92%), Stigmastan-3, 5-diene (6.17%), 5(1H)-Azulenone, 2, 4, 6, 7, 8, 8a-hexahydro-3, 8-dimethyl-4-(1-methylethylidene)-, (8S-cis)- (24.44%), 2-Cyclohexane-1-carboxaldehyde, 2, 6-dimethyl-6-(4-methyl-3-pentennyl (18.15%), Stigmastan-3, 5-diene (24.04%), 2(1H)Naphthalenone, 3, 5, 6, 7, 8, 8a-hexanhydro-4, 8a-dimethyl-6-(1-methylethenyl)-(6.49%), 2-[p-Methoxyphenyl]-8-methylcinchoninic acid (12.98%), Ergosta-4, 6, 22-trien-3, beta, -ol (13.57%), and Stigmastan-3, 5-diene (26.05%). Therefore, Phytonutrients could also provide significant benefits for human's health that eat plant foods.**

***Index Terms*—GC-MS, Phytochemical constituent, Lotus**

I. Introduction

Plants are rich sources of primary and secondary metabolites with interesting biological activities [1]. It is also the best sources for obtaining natural antioxidants for various medicinal uses such as aging and disease related to radical mechanism [2].

Phytonutrients, also called phytochemicals, are chemicals produced by plants. Plants use phytonutrients to stay healthy. For example, some phytonutrients protect plants from insect attacks, while others protect against radiation from UV rays.Phytonutrients can also provide significant benefits for humans who eat plant foods. Phytonutrient-rich foods include colorful fruits and vegetables, legumes, nuts, tea, whole grains and many spices. They affect human health but are not considered nutrients that are essential for life, like carbohydrates, protein, fats, vitamins and minerals.

Among the benefits of phytonutrients are antioxidant and anti-inflammatory activities. Phytonutrients may also enhance immunity and intercellular communication, repair DNA damage from exposure to toxins, detoxify carcinogens and alter estrogen metabolism.

Various phytochemical compounds have been identified from plants using phytochemical approaches to date. The plant extracts revealed the presence of various secondary metabolites and these include phenolic, alkaloids, flavonoids, glycosides, tannins, steroids, and its derivatives [3], [4]. Those alkaloids, steroids, and flavonoids have potent antiepileptic effect in various seizure models [5]. In addition, saponins have also been able to modulate the neurotransmitter levels in the brain and to process potent anti-convulsant activity [6].

Therefore, the present study was carried out to investigate the phytochemical constituents of *N. nucifera* by using gas chromatography mass spectrometry (GC-MS). It is expected that this study will provide another useful resource for extraction of phytochemicals from this lotus species which can be used as dietary supplements.

II. Materials and Methods

A. Plant Materials and Extractions

Lotus species (*N. nucifera*) including of Roseum Plenum (RP), Album Plenum (AP), and Hindu Lotus (HI) were obtained from lotus museum, Rajamangala University of Technology Thanyaburi, Pathumthani, Thailand. The part of each lotus is divided into leaf, stalk, and flower. All of parts were dried and grinded. They were extracted with absolute ethanol by maceration [7]. The ethanolic extract were evaporated in rotary evaporator and prepared for GC-MS analysis.

B. Gas Chromatography-mass Spectrometry Analysis

Gas chromatography-mass spectrometry (GC-MS) analysis of these extracts was carried out by following the modify method of Singariya *et al.* [8]. GC-MS analysis was performed on an Agilent 7890 GC system instrument equipped with HP-5MS (5% diphenyl 95% dimethylpolysiloxane) column (30m x 0.25 mm x 0.25 μm) and interfaced to a 5975C inert XL MSD with Triple-Axis Detector. An injection volume of 2 μL was employed (spitless) and an injector temperature 250 ℃. The column temperature was increased from 60 ℃ to 250 ℃ at a rate 5 ℃/min. The outlet temperature was

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280 ℃. Mass spectra were taken at 70 eV and fragments from 40 to 550 Da. The MS transfer line temperature was 250 ℃. Identification of the compounds was conducted using the database of the National Institute of Standards and Technology (NIST) library version 11. The name, molecular weight, molecular formula, and area under the peak of the test material components were ascertained.

III. Results and Discussion

The compounds with their retention time (RT), molecular formula (MF), molecular weight (MW), peak area (%), and IUPAC name in the ethanolic extracts of leaf, stalk, and flower parts of each lotus were presented in Table I. In the present investigation of RP in Table I, the leaf extract showed the presence of 8 compounds namely, 4-[4-(4-Chloro-phenyl)-thiazol-2-yl]-piperazin-2-one, Pyridine-3,4-dicarboxylic acid,2,6-dimethyl-4-[[5-(4-pyridinyl)-1H-1,2,3,4-tetrazol-1-yl]methyl]-, 1H-Phenanthro[9,10-d]imidazole,6-Methoxy-2-[p-tolyl] cinchoninic acid, 2,2',5',2''-Terrhiophene, 5-nitro-, and Coumarine, 3-(2-benzoxazolyl)-8-methoxy-. The stalk extracts exhibited 7 compounds namely, S-Methyl methanethiosulphonate, Stigmastan-3,5-diene, Beta-Sitosterol acetate, Sesquirosefuran, Acetamide, N-(2-cyclopropylphenyl)-2-(3-methylphenoxy)-, 2(1H)Naphthalenone, 3, 5, 6, 7, 8, 8a-hexanhydro-4, 8a dimethyl-6-(1-methylethenyl)-, and 1, 2, 5-Oxadiazol-3-amine, 4-(3-methoxyphenoxy)-. The flower showed the presence of 12 compounds namely, Benzene,1-[(2-chloroethyl)sulfonyl]-4-nitro-, Coumarine, 3-(2-benzoxazolyl)-8-methoxy-, S-Methyl methanethiosulphonate, Stigmastan-3, 5-diene, Nootkatone, 2-Amino-4-cyanomethyl-6-piperidino-1, 3, 5-triazine, Thiophene-2-carboxylic acid, 4-cyano-3-(4-fluorophenyl)-5-methythio, Benzo[b]naphtho[2,3-d]furan-2-ylboronic acid, 5H-3, 5a-Epoxynaphth[2, 1-c]oxepin, dodecahydro-3, 8, 8, 11a-tetramethyl-, Pyrene, Hexadecahydro-, 5(1H)-Azulenone, 2, 4, 6, 7, 8, 8a-hexahydro-3, 8-dimethyl-4-(1-methylethylidene)-, (8S-cis)-, and 1, 3-Dithiolane, 2-(28-norurs-12-en-17-yl)-.

TABLE I. Activity of Bioactive Compounds Identified in the Ethanolic Extract of Roseum Plenum

No.	RT	Name of the compounds	MF	MW	Peak area (%)	IUPAC Name
Roseum Plenum leaf						
1	21.63	4-[4-(4-Chloro-phenyl)-thiazol-2-yl]-piperazin-2-one	$C_{13}H_{12}ClN_3OS$	293.77	8.63	4-[4-(4-chlorophenyl)-1,3-thiazol-2-yl] piperazin-2-one
2	26.05	Pyridine-3, 4-dicarboxylic acid	$C_7H_5NO_4$	167.12	8.35	pyridine-3,4-dicarboxylic acid
3	26.21	1H-Phenanthro [9, 10-d] imidazole	$C_{15}H_{10}N_2$	218.25	3.33	1H-phenanthro[9,10-d] imidazole
4	26.58	6-Methoxy-2-[p-tolyl] cinchoninic acid	$C_{18}H_{15}NO_3$	293.3	23.92	6-methoxy-2-(4-methylphenyl) quinoline-4-carboxylic acid
5	26.81	2, 2', 5', 2''-Terrhiophene, 5-nitro-	$C_{12}H_7NO_2S_3$	293.4	0.87	2-(5-nitrothiophen-2-yl)-5-thiophen-2-ylthiophene
6	26.85	Coumarine, 3-(2-benzoxazolyl)-8-methoxy-	$C_{17}H_{11}NO_4$	293.27	1.95	3-(1,3-benzoxazol-2-yl)-8-methoxychromen-2-one
Roseum Plenum stalk						
1	25.84	S-Methyl methanethiosulphonate	$C_2H_6O_2S_2$	126.2	1.49	methylsulfonylsulfanylmethane
2	25.97	Stigmastan-3, 5-diene	$C_{29}H_{48}$	396.7	6.17	17-(5-ethyl-6-methylheptan-2-yl)-10,13-dimethyl-2,7,8,9,11,12,14,15,16,17-decahydro-1H-cyclopenta[a]phenanthrene
3	26.07	Beta-Sitosterol acetate	$C_{31}H_{52}O_2$	456.7	2.98	[17-(5-ethyl-6-methylheptan-2-yl)-10,13-dimethyl-2,3,4,7,8,9,11,12,14,15,16,17-dodecahydro-1H-cyclopenta[a]phenanthren-3-yl] acetate
4	26.18	Sesquirosefuran	$C_{15}H_{22}O$	218.33	1.31	2-[(2E)-3,7-dimethylocta-2,6-dienyl]-3-methylfuran
5	26.22	Acetamide, N-(2-cyclopropylphenyl)-2-(3-methylphenoxy)-	$C_{18}H_{19}NO_2$	281.3	2.74	N-(2-cyclopropylphenyl)-2-(3-methylphenoxy) acetamide
6	27.82	2(1H) Naphthalenone, 3, 5, 6, 7, 8, 8a-hexanhydro-4, 8a-dimethyl-6-(1-methylethenyl)-	$C_{15}H_{22}O$	218.33	1.34	4,8a-dimethyl-6-prop-1-en-2-yl-1,3,5,6,7,8-hexahydronaphthalen-2-one
7	28.03	1, 2, 5-Oxadiazol-3-amine, 4-(3-methoxyphenoxy)-	$C_9H_9N_3O_3$	207.19	1.38	4-(3-methoxyphenoxy)-1,2,5-oxadiazol-3-amine
Roseum Plenum flower						
1	21.71	Benzene, 1-[(2-chloroethyl) sulfonyl]-4-nitro-	$C_8H_8ClNO_4S$	249.67	0.44	1-(2-chloroethylsulfonyl)-4-nitrobenzene
2	21.76	Coumarine, 3-(2-benzoxazolyl)-8-methoxy-	$C_{17}H_{11}NO_4$	293.27	0.32	3-(1,3-benzoxazol-2-yl)-8-methoxychromen-2-one
3	24.17	S-Methyl methanethiosulphonate	$C_2H_6O_2S_2$	126.2	1.25	methylsulfonylsulfanylmethane

No.	RT	Name of the compounds	MF	MW	Peak area (%)	IUPAC Name
4	26.29	Stigmastan-3, 5-diene	$C_{29}H_{48}$	396.7	9.69	17-(5-ethyl-6-methylheptan-2-yl)-10,13-dimethyl-2,7,8,9,11,12,14,15,16,17-decahydro-1H-cyclopenta[a]phenanthrene
5	26.44	Nootkatone	$C_{15}H_{22}O$	218.33	4.59	(4R,4aS,6R)-4,4a-dimethyl-6-prop-1-en-2-yl-3,4,5,6,7,8-hexahydronaphthalen-2-one
6	26.63	2-Amino-4-cyanomethyl-6-piperidino-1, 3, 5-triazine	$C_{10}H_{14}N_6$	218.26	5.76	2-(4-amino-6-piperidin-1-yl-1,3,5-triazin-2-yl) acetonitrile
7	26.67	Thiophene-2-carboxylic acid, 4-cyano-3-(4-fluorophenyl)-5-methythio	$C_{13}H_8FNO_2S_2$	293.3	2.46	4-cyano-3-(4-fluorophenyl)-5-methylsulfanylthiophene-2-carboxylic acid
8	26.71	Benzo[b]naphtho[2,3-d] furan-2-ylboronic acid	$C_{16}H_{11}BO_3$	262.1	3.65	naphtho [2,3-b][1] benzofuran-2-ylboronic acid
9	26.731	5H-3, 5a-Epoxynaphth [2, 1-c] oxepin, dodecahydro-3, 8, 8, 11a-tetramethyl-	$C_{18}H_{30}O_2$	278.4	7.24	5,5,9,13-tetramethyl-14,16-dioxatetracyclo [11.2.1.01,10.04,9] hexadecane
10	26.80	Pyrene, Hexadecahydro-	$C_{16}H_{26}$	218.38	1.88	1,2,3,3a,4,5,5a,6,7,8,8a,9,10,10a,10b,10c-hexadecahydropyrene
11	27.94	5(1H)-Azulenone, 2, 4, 6, 7, 8, 8a-hexahydro-3, 8-dimethyl-4-(1-methylethylidene)-, (8S-cis)-	$C_{15}H_{22}O$	218.33	24.44	(8S,8aS)-3,8-dimethyl-4-propan-2-ylidene-1,2,6,7,8,8a-hexahydroazulen-5-one
12	28.82	1, 3-Dithiolane, 2-(28-norurs-12-en-17-yl)-	$C_{32}H_{52}S_2$	500.9	1.80	2-(1,2,6a,6b,9,9,12a-heptamethyl-2,3,4,5,6,6a,7,8,8a,10,11,12,13,14b-tetradecahydro-1H-picen-4a-yl)-1,3-dithiolane

In the present investigation of AP in Table II, the leaf extract showed the presence of 7 compounds namely, Benzoic acid, 4-(methylthio)-3-nitro-, Trans-1-Chloro-1, 3-dimethylsilacyclohexane, 1H-Indole, 5-methyl-2-phenyl-, 2-Oxo-4-phenyl-6-(4-nitrophenyl)-1,2-dihydropyrimidine, 4-Azaphenanthrene, 1-methyl-3-phenylethynyl-, [4-(1-Isobutyl-1H-benzoimidazol-2-yl) phenyl] (dimethyl)amine, 2-Cyclohexane-1-carboxaldehyde, 2, 6-dimethyl-6-(4-methyl-3-pentennyl. The stalk extracts exhibited 2 compounds namely, Stigmastan-3, 5-diene and 2-Ethylacridine. The flower showed the presence of 7 compounds namely, Eicosane, 1H-Indole, 5-methyl-2-phenyl-, Stigmastan-3, 5-diene, 2-Ethylacridine, Stannane, tetraethyl-, 2(1H)Naphthalenone, 3, 5, 6, 7, 8, 8a-hexanhydro-4, 8a-dimethyl-6-(1-methylethenyl)-, Benzo[b]naphtho[2,3-d]furan-2-ylboronic acid, 5(1H)-Azulenone, 2, 4, 6, 7, 8, 8a-hexahydro-3, 8-dimethyl-4-(1-methylethylidene)-, (8S-cis)-, Acetic acid butyl-methyl-phosphinoylmethyl ester, 1H-Indole, 5-methyl-2-phenyl-, 2-[p-Methoxyphenyl]-8-methylcinchoninic acid, and 3-Amino-7-nitro-1, 2, 4-benzotrizine 1-oxide.

TABLE II. ACTIVITY OF BIOACTIVE COMPOUNDS IDENTIFIED IN THE ETHANOLIC EXTRACT OF ALBUM PLENUM

No.	RT	Name of the compounds	MF	MW	Peak area (%)	IUPAC Name
Album Plenum leaf						
1	25.36	Benzoic acid, 4-(methylthio)-3-nitro-	$C_8H_7NO_4S$	213.21	2.90	4-methylsulfanyl-3-nitrobenzoic acid
2	26.24	Trans-1-Chloro-1, 3-dimethylsilacyclohexane	$C_7H_{15}ClSi$	162.73	6.38	(1S,3S)-1-chloro-1,3-dimethylsilinane
3	26.47	1H-Indole, 5-methyl-2-phenyl-	$C_{15}H_{13}N$	207.27	0.01	5-methyl-2-phenyl-1H-indole
4	26.64	2-Oxo-4-phenyl-6-(4-nitrophenyl)-1, 2-dihydropyrimidine	$C_{16}H_{11}N_3O_3$	293.28	1.86	6-(4-nitrophenyl)-4-phenyl-1H-pyrimidin-2-one
5	26.71	4-Azaphenanthrene, 1-methyl-3-phenylethynyl-	$C_{22}H_{17}N$	295.4	1.05	4-methyl-2-[(E)-2-phenylethenyl] benzo[h]quinoline
6	26.81	[4-(1-Isobutyl-1H-benzoimidazol-2-yl) phenyl] (dimethyl)amine	$C_{19}H_{23}N_3$	293.4	0.51	N, N-dimethyl-4-[1-(2-methylpropyl) benzimidazol-2-yl] aniline
7	28.48	2-Cyclohexane-1-carboxaldehyde, 2, 6-dimethyl-6-(4-methyl-3-pentennyl	$C_{15}H_{24}O$	220.35	18.15	2,6-dimethyl-6-(4-methylpent-3-enyl) cyclohex-2-ene-1-carbaldehyde
Album Plenum stalk						
1	26.29	Stigmastan-3, 5-diene	$C_{29}H_{48}$	396.7	24.04	17-(5-ethyl-6-methylheptan-2-yl)-10,13-dimethyl-2,7,8,9,11,12,14,15,16,17-decahydro-1H-cyclopenta[a]phenanthrene
2	26.54	2-Ethylacridine	$C_{15}H_{13}N$	207.27	0.39	2-ethylacridine

No.	RT	Name of the compounds	MF	MW	Peak area (%)	IUPAC Name
Album Plenum flower						
	18.60	Eicosane	$C_{20}H_{42}$	282.5	1.40	icosane
1	24.31	1H-Indole, 5-methyl-2-phenyl-	$C_{15}H_{13}N$	207.27	0.43	5-methyl-2-phenyl-1H-indole
2	26.28	Stigmastan-3, 5-diene	$C_{29}H_{48}$	396.7	5.86	17-(5-ethyl-6-methylheptan-2-yl)-10,13-dimethyl-2,7,8,9,11,12,14,15,16,17-decahydro-1H-
3	26.55	2-Ethylacridine	$C_{15}H_{13}N$	207.27	0.11	2-ethylacridine
4	26.73	Stannane, tetraethyl-	$C_8H_{20}Sn$	234.95	0.73	tetraethylstannane
5	26.97	2(1H) Naphthalenone, 3, 5, 6, 7, 8, 8a-hexanhydro-4, 8a-dimethyl-6-(1-methylethenyl)-	$C_{15}H_{22}O$	218.33	6.49	4,8a-dimethyl-6-prop-1-en-2-yl-1,3,5,6,7,8-hexahydronaphthalen-2-one
6	28.11	Benzo[b]naphtho[2,3-d] furan-2-ylboronic acid	$C_{16}H_{11}BO_3$	262.1	1.55	naphtho [2,3-b][1] benzofuran-2-ylboronic acid
7	28.27	5(1H)-Azulenone, 2, 4, 6, 7, 8, 8a-hexahydro-3, 8-dimethyl-4-(1-methylethylidene)-, (8S-cis)-	$C_{15}H_{22}O$	218.33	3.82	(8S,8aS)-3,8-dimethyl-4-propan-2-ylidene-1,2,6,7,8,8a-hexahydroazulen-5-one

In the present investigation of HI in Table III, the leaf extract showed the presence of 4 compounds namely, Acetic acid butyl-methyl-phosphinoylmethyl ester, 1H-Indole, 5-methyl-2-phenyl-, 2-[p-Methoxyphenyl]-8-methylcinchoninic acid, and 3-Amino-7-nitro-1, 2, 4-benzotriazine-1-oxide. The stalk extracts exhibited 5 compounds namely, Ergosta-4, 6, 22-trien-3, beta, -ol, 2-[p-Methoxyphenyl]-8-methylcinchoninic acid, Benzo[b]naphtho[2,3-d]furan-2-ylboronic acid, 5(1H)-Azulenone, 2, 4, 6, 7, 8, 8a-hexahydro-3, 8-dimethyl-4-(1-methylethylidene)-, (8S-cis)-, and 4-Dehydroxy-N-(4, 5-methylenedioxy-. The flower showed the presence of 5 compounds namely, Stigmastan-3, 5-diene, 6, beta, Bicyclo[4, 3, 0]nonane, 5, beta, -iodomethyl-1, beta, -isopropenyl-4, alpha, 5, alpha, -dimethyl-, 2(1H)Naphthalenone, 3, 5, 6, 7, 8, 8a-hexanhydro-4, 8a-dimethyl-6-(1-methylethenyl)-, 5(1H)-Azulenone, 2, 4, 6, 7, 8, 8a-hexahydro-3, 8-dimethyl-4-(1-methylethylidene)-, (8S-cis)-, and Chola-5, 22-dien-3-ol, (3.beta.,22Z)-.

In accordance with the previous finding, most of the identified compounds from this study also been reported elsewhere in other species. For instance, the major compound of ethanolic extract of RP leaf, stalk and flower was 6-Methoxy-2-[p-tolyl]cinchoninic acid (23.92%), Stigmastan-3, 5-diene (6.17%), and 5(1H)-Azulenone, 2, 4, 6, 7, 8, 8a-hexahydro-3, 8-dimethyl-4-(1-methylethylidene)-, (8S-cis)- (24.44%), respectively. the major compound of ethanolic extract of AP leaf, stalk and flower was 2-Cyclohexane-1-carboxaldehyde, 2, 6-dimethyl-6-(4-methyl-3-pentennyl(18.15%), Stigmastan-3, 5-diene (24.04%), and 2(1H)Naphthalenone, 3, 5, 6, 7, 8, 8a-hexanhydro-4, 8a-dimethyl-6-(1-methylethenyl)-(6.49%), respectively. The major compound of ethanolic extract of HI leaf, stalk and flower was 2-[p-Methoxyphenyl]-8-methylcinchoninic acid (12.98%), Ergosta-4, 6, 22-trien-3, beta, -ol (13.57%), and Stigmastan-3, 5-diene (26.05%), respectively.

TABLE III. ACTIVITY OF BIOACTIVE COMPOUNDS IDENTIFIED IN THE ETHANOLIC EXTRACT OF HINDU LOTUS

No.	RT	Name of the compounds	MF	MW	Peak area (%)	IUPAC Name
Hindu Lotus leaf						
1	21.75	Acetic acid butyl-methyl-phosphinoylmethyl ester	$C_8H_{17}O_3P$	192.19	0.02	[butyl(methyl)phosphoryl] methyl acetate
2	26.22	1H-Indole, 5-methyl-2-phenyl-	$C_{15}H_{13}N$	207.27	0.80	5-methyl-2-phenyl-1H-indole
3	26.30	2-[p-Methoxyphenyl]-8-methylcinchoninic acid	$C_{18}H_{15}NO_3$	293.3	12.98	2-(4-methoxyphenyl)-8-methylquinoline-4-carboxylic acid
4	27.01	3-Amino-7-nitro-1, 2, 4-benzotriazine-1-oxide	$C_7H_5N_5O_3$	207.15	0.21	7-nitro-1-oxido-1,2,4-benzotriazin-1-ium-3-amine
Hindu Lotus stalk						
1	26.26	Ergosta-4, 6, 22-trien-3, beta, -ol	$C_{28}H_{44}O$	396.6	13.57	(3S,8S,9S,10R,13R,14S,17R)-17-[(E,2R,5R)-5,6-dimethylhept-3-en-2-yl]-10,13-dimethyl-2,3,8,9,11,12,14,15,16,17-decahydro-1H-cyclopenta[a]phenanthren-3-ol
2	26.71	2-[p-Methoxyphenyl]-8-methylcinchoninic acid	$C_{18}H_{15}NO_3$	293.3	8.74	2-(4-methoxyphenyl)-8-methylquinoline-4-carboxylic acid
3	26.94	Benzo[b]naphtho[2,3-d] furan-2-ylboronic acid	$C_{16}H_{11}BO_3$	262.1	3.77	naphtho [2,3-b][1] benzofuran-2-ylboronic acid
4	28.30	5(1H)-Azulenone, 2, 4, 6, 7, 8, 8a-hexahydro-3, 8-dimethyl-4-(1-	$C_{15}H_{22}O$	218.33	2.86	(8S,8aS)-3,8-dimethyl-4-propan-2-ylidene-1,2,6,7,8,8a-

No.	RT	Name of the compounds	MF	MW	Peak area (%)	IUPAC Name
		methylethylidene)-, (8S-cis)-				hexahydroazulen-5-one
5	28.77	4-Dehydroxy-N-(4, 5-methylenedioxy-	$C_{16}H_{14}N_2O_4$	298.29	1.52	1-(6-nitro-1,3-benzodioxol-5-yl)-N-(2-phenylethyl) methanimine
Hindu Lotus flower						
1	26.35	Stigmastan-3, 5-diene	$C_{29}H_{48}$	396.7	26.05	17-(5-ethyl-6-methylheptan-2-yl)-10,13-dimethyl-2,7,8,9,11,12,14,15,16,17-decahydro-1H-
2	26.76	6, beta, Bicyclo[4, 3, 0]nonane, 5, beta, -iodomethyl-1, beta, -isopropenyl-4, alpha, 5, alpha, -dimethyl-,	$C_{15}H_{25}I$	332.26	8.54	4-(iodomethyl)-4,5-dimethyl-7a-prop-1-en-2-yl-2,3,3a,5,6,7-hexahydro-1H-indene
3	27.03	2(1H) Naphthalenone, 3, 5, 6, 7, 8, 8a-hexanhydro-4, 8a-dimethyl-6-(1-methylethenyl)-	$C_{15}H_{22}O$	218.33	13.51	4,8a-dimethyl-6-prop-1-en-2-yl-1,3,5,6,7,8-hexahydronaphthalen-2-one
4	28.35	5(1H)-Azulenone, 2, 4, 6, 7, 8, 8a-hexahydro-3, 8-dimethyl-4-(1-methylethylidene)-, (8S-cis)-	$C_{15}H_{22}O$	218.33	24.98	(8S,8aS)-3,8-dimethyl-4-propan-2-ylidene-1,2,6,7,8,8a-hexahydroazulen-5-one
5	28.59	Chola-5, 22-dien-3-ol, (3. beta.,22Z)-	$C_{24}H_{38}O$	342.6	7.05	(3S,8S,9S,10R,13R,14S,17R)-10,13-dimethyl-17-[(Z,2R)-pent-3-en-2-yl]-2,3,4,7,8,9,11,12,14,15,16,17-dodecahydro-1H-cyclopenta[a]phenanthren-3-ol

These compounds were also reported as major compounds were identified in the various parts of plants as Eicosane, (1H) Naphthalenone, 3, 5, 6, 7, 8, 8a-hexanhydro-4, 8a-dimethyl-6-(1-methylethenyl)-was reported in the methanolic root extract of *Hypochaeris radicata* [9].

Stigmastan-3, 5-dienewas the formation of stigmasta-3,5-diene (STIG) in vegetable oils from beta-sitosterol was investigated. [10] and identified in the ethanolic extract of *N. nucifera* seed [11].

Imidazolewas found in ethanolic and methanolic extracts of the *Adhatoda vasica* leaves. Phytosterols was major bioactive compounds of *Musa sapientum* spadix identified by GC-MS [12].

IV. Conclusion

According to our results, the compounds were identified from the ethanolic leaf, stalk, and flower extract of lotus by using GC-MS analysis. The presence of various bioactive compounds in the extracts justifies the use of this plant for various ailments by traditional practioners. Futher investigation into isolation of pure compounds and pharmacological sutdies were need to give useful results. From the above results, it could be recommended as a plant of phytochemical, phytophamaceutical, and phytonutrient importance.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

Warachate Khobjai had conducted the research, analyzed the extract and the data; Khemjira Jarmkom, Nakuntwalai Wisidsri and Surachai Techaoei had collected samples and extracted samples; all authors had approved the final version.

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