International Journal of Science and Research Archive

eISSN: 2582-8185

Cross Ref DOI: 10.30574/ijsra

Journal homepage: https://ijsra.net/

(RESEARCH ARTICLE)

Check for updates

Qualitative and quantitative evaluation of phytochemicals extraction of five *Pogostemon species* of Manipur

Soraisham Jullita Devi [1], Joyshree lairenjam [2], Rita Devi [1], Maibam Haripriya Devi [3], S.Sanjay Singh [4] and Potsangbam Kumar Singh [1,*]

[1] *Department of Botany, Manipur International University, Ghari awang leikai, Imphal, Manipur, 795140.*
[2] *Department of Dravyaguna Vigyan, Parul Institute of Ayurved, Parul University, Vadodara, Gujarat 391760, India.*
[3] *Department of Botany, Manipur College, Imphal-795001, Manipur, India.*
[4] *ICAR Research Complex for NEH, Region Manipur Centre, Lamphelpat, Imphal-795004.*

International Journal of Science and Research Archive, 2025, 17(03), 652-663

Publication history: Received 11 November 2025; revised on 16 December 2025; accepted on 18 December 2025

Article DOI: https://doi.org/10.30574/ijsra.2025.17.3.3288

Abstract

This study about the analysis of phytochemicals evaluation of five *Pogostemon* species of Manipur are *Pogostemon* cablin (Blanco), *Pogostemon heyneanus* (Benth), *Pogostemon parviflorus* (Benth), *Pogostemon quadrifolius* (Benth) F. Muell, *Pogostemon benghalensis* (Burm.f) Kuntze, the presence of phytochemicals having very economic importance, it can be used in pharmacologist, soap, perfume, lotion, shampoo industries and ethnomedicine. Some of the new compounds are worth to be mentioned are: (a) from Pogostemon benghalensis- 1-formyl-2,2-dimethyl-3-trans-(3-methyl-but-2-enyl)-6-methylidene-cyc, (b) from *Pogostemon cablin*-(3r,3ar,7r,8as)-3,8,8-trimethyl-6-methyleneoctahydro-1h-3a,7-methanol,(c)from *Pogostemon heyneanus*- naphthalene,1,2,3,5,6,7,8,8a-octahydro-1,8a-dimethyl-7-(1-methylethyl) etc.

Keywords: *Pogostemon species;* Phytochemical; New compound; GCMS; LCMS.

1. Introduction

Pogostemon species belongs to Lamiaceae family, it has three sub-genera are *Pogostemon Sensu* Bhatti & Ingr., *Allopogostemon* Bhatti & Ingr., *Dysophyllus* (Blume) Bhatti & Ingr., *Pogostemon* has come from Greek word "Pogo" means bearded and "Stamon" means Stamen, Genus of *Pogostemon* is divided into two based on habited they are *Pogostemon Sensu Stricto* (S.S.) and *Dysophylla Bl.* Or *Drysophylla El.* Gazzar of Marshland. *Pogostemon species* belongs to lamiaceae family. 96 species of *Pogostemon* are represented in the globe, highest 56 taxa are 53 species and 3 varieties, out of 22 taxa are 19 species and 3 varieties, 13 are endemic and 6 are distributed, India has highest number of *Pogostemon* in the world. It has three sub-genera (a) *Pogostemon Sensu* Bhatti & Ingr. (b) *Allopogostemon* Bhatti & Ingr. (c) *Dysophyllus* (Blume) Bhatti & Ingr., *Pogostemon* come from Greek word "Pogo stamon" Pogo means "Bearded" and Stamon means "stamen". Most of the *Pogostemon species* are native from China, Indonesia, India and Myanmar, *Pogostemon species* are divided into two depend on the habit, are *Pogostemon Sensu Stricto* (S.S) and *Dryshophylla Bl.* Or *Drysophylla El. Gazzar* of Marshland. (a) *Pogostemon Sensu Stricto* (S.S) is a terrestrial group of Subshrubs or herbs. (b) *Dryshophylla Bl.* Or *Drysophylla El. Gazzar* of marshland is the aquatic group or marshland group of *Pogostemon*, it is Sessile, Small flower than terrestrial groups. *Pogostemon species* are used in the ethnomedicine of Snake bite, chicken pox, cold, headache, irregular menstruation, cough, abdominal pain, vomiting, diarrhea, nausea, fever, scorpion string, anti-inflammatory disease, also used in the fragrant industries, such as lotion, perfumery, shampoo & cosmetic purposed. This paper is studys about the analysis of phytochemicals evaluation of five *Pogostemon species* of Manipur, they are *Pogostemon cablin* (Blanco), *Pogostemon heyneanus* (Benth), *Pogostemon parviflorus* (Benth) *Pogostemon*

* Corresponding author: Potsangbam Kumar Singh

quadrifolius (Benth) f. muell, *Pogostemon benghalensis* (Burm.f) kuntze. Many alkaloids, phenolic compounds, flavonoids, saponins, tannin, ammino acid, Carbohydrate and other compounds are found [1].

2. Review of Literature

The world population of Lamiaceae family is unique having 236 genera and 7,172 species [1]. They are cosmopolitan in distribution, however, whose center is chiefly in the Mediterranean region, where they form a major dominant part of Lamiaceae [2]. This family is regarded as being one of the highly evolved plant families, at least from the viewpoint of floral structure. Many researchers have been working on the taxonomic updating including nomenclature and classification of the family. The modern circumscription of Lamiaceae includes many genera which were formerly placed in the Verbenaceae [3, 1]. Several phylogenists believed that angiosperms are monophyletic i.e. group originated from single ancestor [4]. [3] observed that the family Lamiaceae as circumscribed by [5] and [6] Briquet was polyphyletic. The phylogenetic imperative dictates that all supra-specific taxa should be monophyletic, and it should be the central principle to the professional world view of many phylogenetic systematists [7]. The best classification would be a cladistic one, in which all recognized groups are strictly monophyletic. To circumscribe monophyletic groups of Lamiaceae, [3] introduced a revised classification following the earliest work of Junell (1934) which was modified by [1, 8].

3. Materials and methods

Plants collect from five valley districts of Manipur, are Imphal east, Imphal west, Kakching, Bishnupur and Thoubal. These *Pogostemon specieses* are investigated and planted in the Manipur International University Museum of Plants (MIUMOP) and Identification by BSI Shillong.

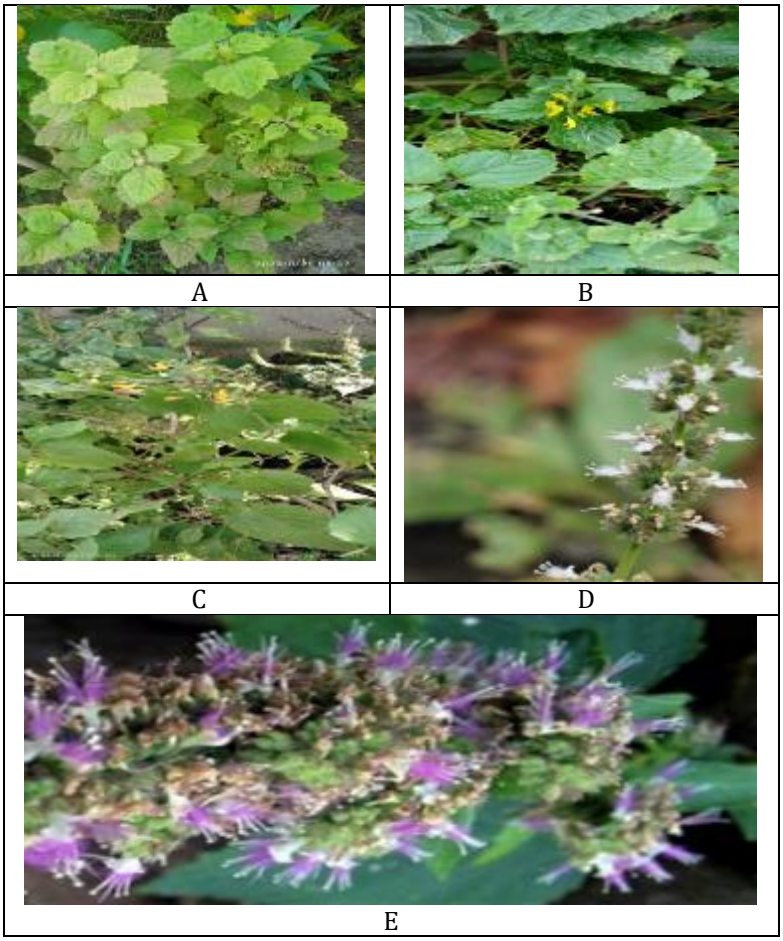


Figure 1 Five *Pogostemon* species: A. *Pogostemon cablin* (Blanco), B. *Pogostemon heyneanus* (Benth), C. *Pogostemon parviflorus* (Benth), D. *Pogostemon quadrifolius* (Benth) f. muell, E. *Pogostemon benghalensis* (Burm.f) Kuntze.

Healthy fresh leaves are washed thoroughly and dry in the room for about 4 months and grinded into fine particles and extraction by using Soxhlet apparatus & solvent petroleum ether. This extracted oxygenated oil was analysis in the Gas chromatography mass spectrometry (GCMS) [9, 10]. And healthy fresh leaves, flowers and Stem are wash thoroughly for removed of mud and microorganism, weighing known weigh and extraction by using Cleavenger apparatus, this Volatile oil is analysis in Liquid Chromatography mass spectrometry (LCMS). [11,12,13, 14, 15].

4. Result and Discussion

Pogostemon cablin is known as "*Patchouli*" in Local name were collected from various localities of Manipur, India and its native from Philippines.

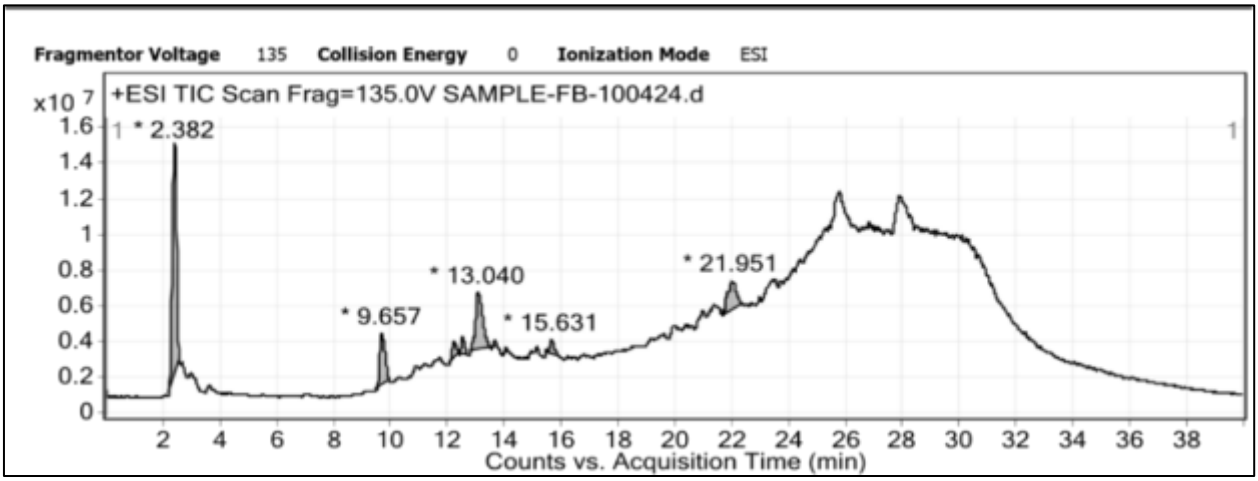
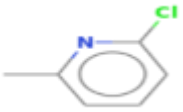
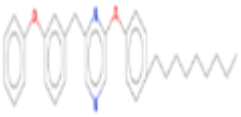


Figure 2 Phytochemical analysis of *Pogostemon cablin* by using LCMS

Table 1 Five highest peaks for LCMS analysis of *Pogostemon cablin*.

Sl. No.	m/z	Compound name	Formula	Structure
1.	127	Pyridine, 2-Chloro-6-methyl.	C_6H_6CIN	
2.	480.3	2- (P-nonylphenoxyl)-6- (P-phenoxybenzyl) Pyrazin.	$C_{32}H_{36}N_2O_2$	
3.	437.2	Fluphenazine	$C_{22}H_{26}F_3N_3OS$	
4.	163.	4-Chloroqunoline.	C_9H_6CIN	
5.	453.4	4,4-Dibromooctafluorobiphenyl	$C_{12}Br_2F_8$	

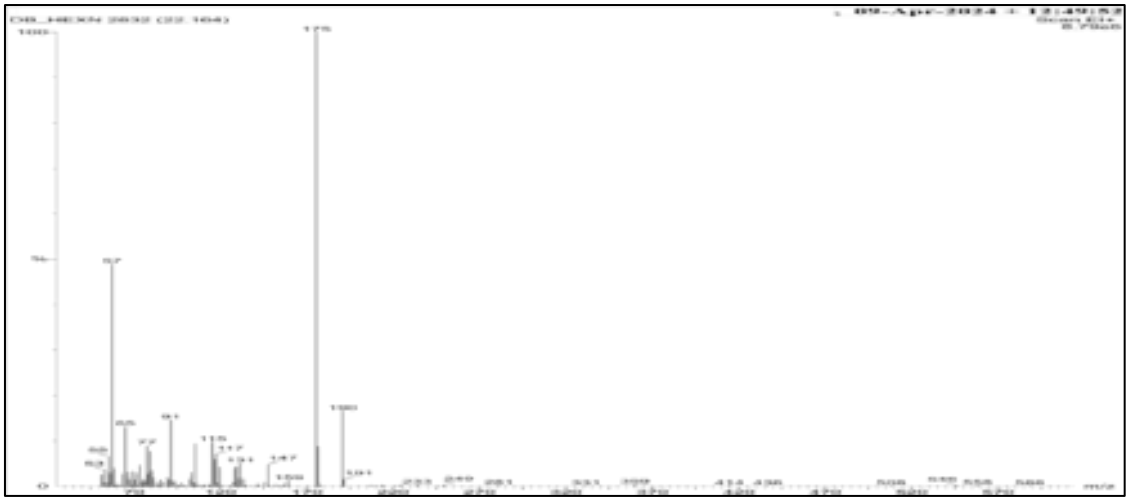


Figure 3 Phytochemical analysis of *Pogostemon cablin* by using GCMS

Table 2 Five highest peaks for GCMS analysis of *Pogostemon cablin* .

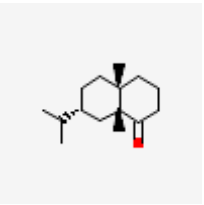
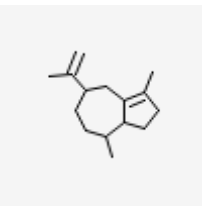
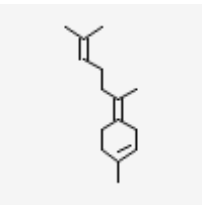
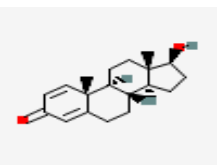
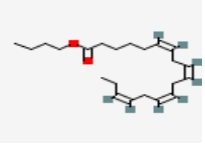
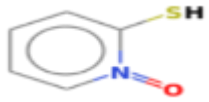
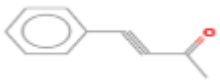
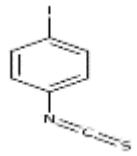
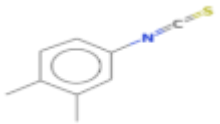
Sl.No.	Compound name	RT	Area	Area%	MW (g/m)	Formula	Structure
1.	1-(2H) -Naphthalenone, Octahydro-4A,8A-Dimethyl-7-(1-Methylethyl)	32.29	1,081,683,840	57.92	222.37	$C_{15}H_{26}O$	
2.	Aciphyllene.	27.196	98,474,008	5.27	204	$C_{15}H_{24}$	
3.	(E)-1-Methyl-4-(6-methylhept-5-en-2-ylidene) Cyclohex-1-ene	28.327	76,708,008	4.10	204.35	$C_{15}H_{24}$	
4.	Boldenone	28.13	41,045,208	2.19	286.4	$C_{19}H_{26}O_2$	
5.	Butyl 6, 9, 12, 15-Octadecatetraenoate	28.53	29,665,310	1.58	204	$C_{22}H_{36}O$	

Figure 4 *Pogostemon heyneanus* Phytochemical analysis by using LCMS

Table 3 *Pogostemon heyneanus* Phytochemical analysis by using LCMS

Sl. No.	m/z	Compound name	Formula	Structure
1.	127	2-Mercaptopyridine-N-oxide.	C_5H_5NOS.	
2.	144.1	4-phenyl-3-butyn-2-One	$C_{10}H_8O$	
3.	160.2	Benzene (Dichloromethyl)	$C_{10}H_{12}Cl_2$	
4.	261.2	4-Iodophenyl Isothiocynate.	C_7H_4INS	
5.	163.1	3,4-Xylyl Isothiocyanate.	C_9H_9NS	

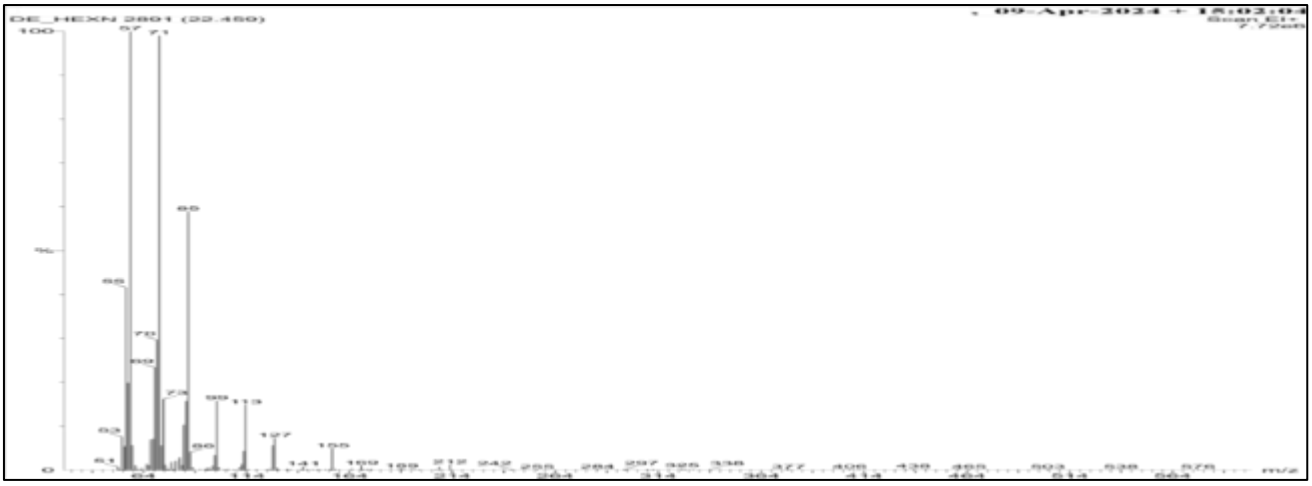


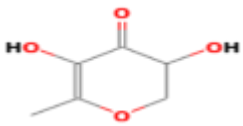
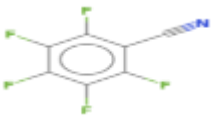
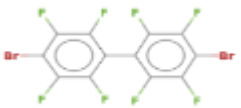
Figure 5 Five highest peaks of *Pogostemon heyneanus* Phytochemicals analysis by using GCMS.

Table 4 Five highest peaks of *Pogostemon heyneanus* Phytochemicals analysis by using GCMS.

Sl.No	Name	R.T.	Area	Area%	M.W.(g/mol)	Formula	Structure
1.	3-methyl-2-(2-oxopropyl) Furan	37.135	46,050,816.	11.899	138.16	$C_8H_{10}O_2$	
2.	2(1H)-Naphthalenone, octahydro-4A-Methyl-7-(1-Methylethyl)	32.25	581,352,256.	6.024	208.34	$C_{14}H_{24}O$	
3.	Aromandendrene.	28.136	4,521,695	1.168	204.35	$C_{15}H_{24}$	
4.	Beta-Longipinene.	27.186	5,809,532.	1.501	204	$C_{15}H_{24}$	
5.	Alpha-Bulnesene.	28.657	4,443,980.	1.148	204.35	$C_{15}H_{24}$	

Figure 6 Five highest peaks analysis of LCMS *Pogostemon parviflorus* Phytochemical analysis by using LCMS

Table 5 Five highest peaks analysis of LCMS *Pogostemon parviflorus* Phytochemical analysis by using LCMS

Sl. No.	m/z	Compound	Formula	Structure
1.	127	P-Chloroaniline.	C_6H_6CIN	
2.	144.1	4H-Pyran-4-ONE, 2,3, dihydro-3,5-dihydroxy-6- methyl.	$C_6H_8O_4$	
3.	485.2	Benzene, (1-tetradecyl pentadecyl)	$C_{35}H_{64}$	
4.	193	Pentaflouroben zonitriles	C_7F_5N	
5.	453.4	4,4- Dibromooctafluoro biphenyl	$C_{12}Br_2F_8$	

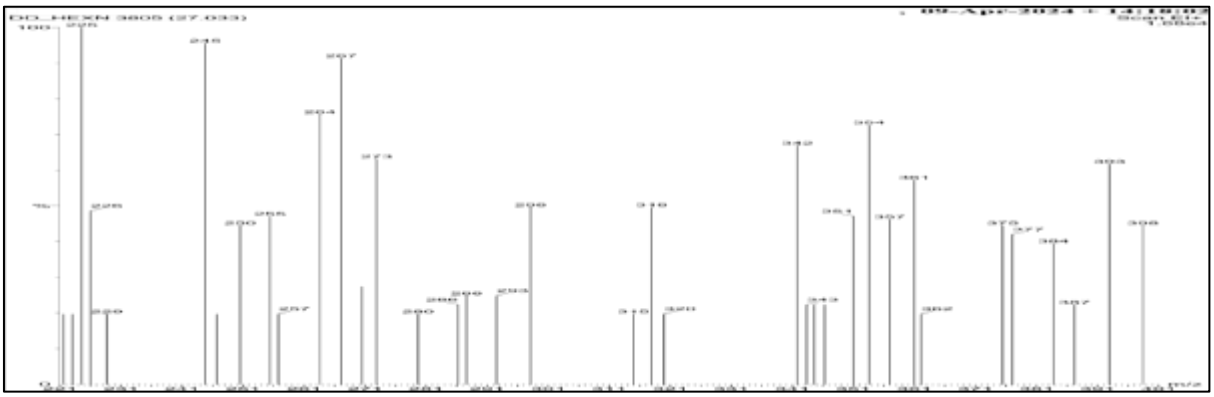
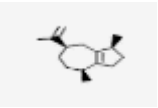
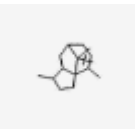


Figure 7 Five highest peaks analysis of LCMS *Pogostemon parviflorus* Phytochemical analysis by using GCMS

Table 6 Five highest peaks analysis of LCMS *Pogostemon parviflorus* Phytochemical analysis by using GCMS

Sl. No	Compound Name	RT	Area	Area%	MW (g/mo)	Formula	Structure
1.	Patchouli alcohol.	32.25	21,593,753	5.02	222.37	$C_{15}H_{26}$	
2.	Longifolene.	28.64	10,829,383	2.52	204.35	$C_{15}H_{24}$	
3.	Alpha- Guaiene.	27.17	10470257	2.43	204	$C_{15}H_{24}$	
4	1H-3A,7 Methanoazulene,2,3,6,7,8,8A-Hexahydro-1,4,9,9-Tetramethyl.	28.31	10,307,461	2.39	204.35	$C_{15}H_{24}$	
5.	Seychellene	28.12	6,731,098	1.56	204.35	$C_{15}H_{24}$	

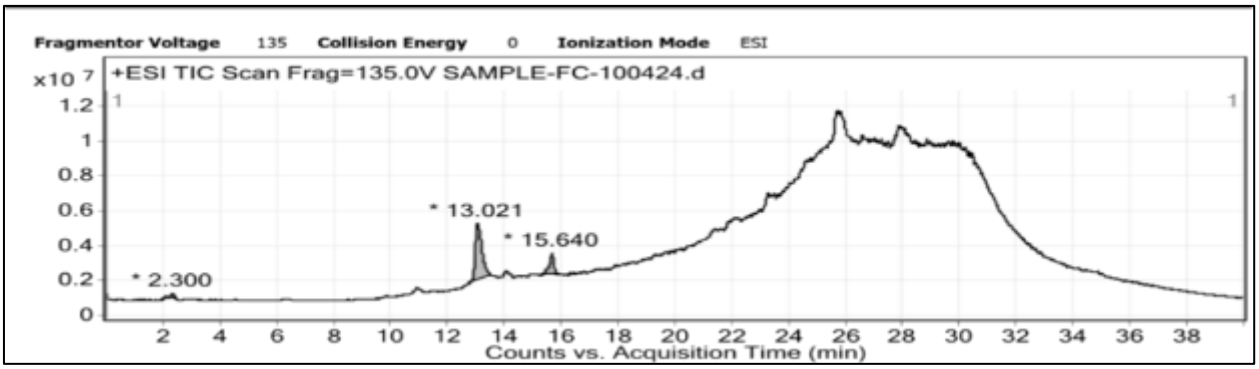
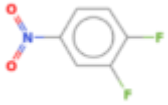
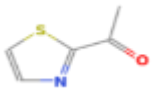
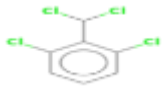


Figure 8 *Pogostemon quadrifolius* Five highest peaks by using LCMS.

Table 7 *Pogostemon quadrifolius* Five highest peaks by using LCMS.

Sl. No.	m/z	Compound name	Formula	Structure
1	158.9	3,4-Difluoronitrobenzene	$C_6H_3F_2NO_2$	
2	127	2-Acetylthiazole	C_5H_5NOS	
3	453.4	Dihydrocapsaicin, O- Pentafluoropropionyl	$C_{21}H_{28}F_5NO_4$	

4	227.9	Benzene,1,3-dichloro-2- (dichloromethyl)	$C_7H_4Cl_4$	

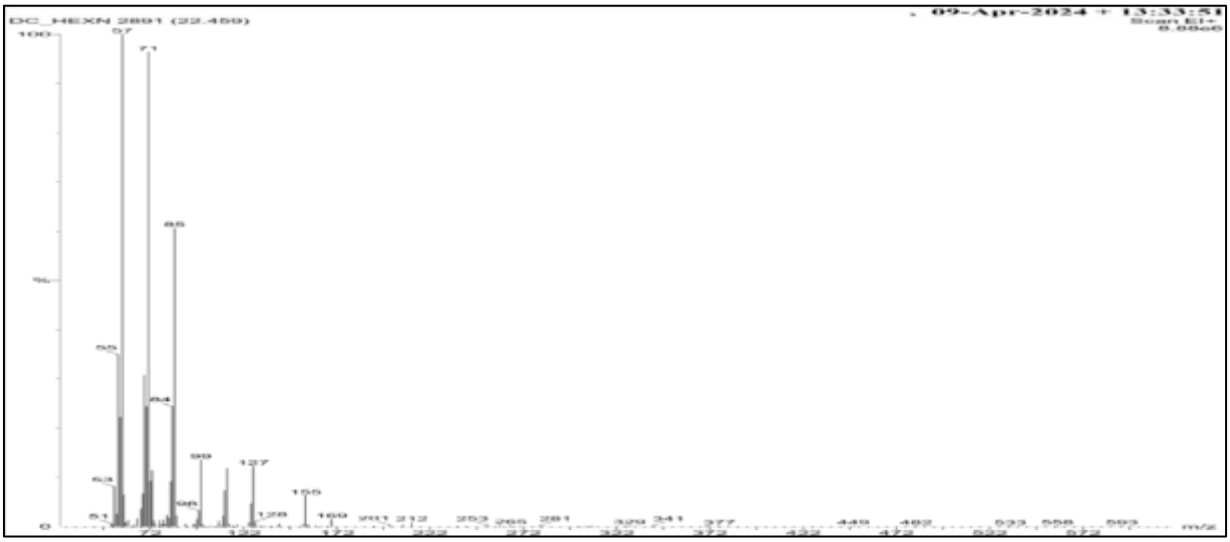
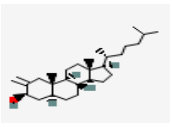
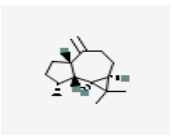
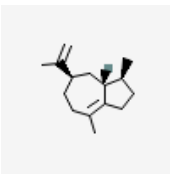
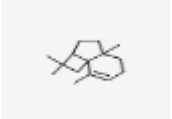


Figure 9 *Pogostemon quadrifolius* Five highest peaks by using GCMS.

Table 8 *Pogostemon quadrifolius* Five highest peaks by using GCMS.

Sl.No.	Compound name	RT	Area	Area%	M.W.(g/mol)	Formula	Structure
1.	Cholestan-3-ol,2-Methylene, (3-Beta, 5-Alpha)	32.26	31,274,156	6.16	400.7	$C_{28}H_{48}O$	
2.	Alloaromadendrene.	27.17	9,632,305	1.89	204	$C_{15}H_{24}$	
3	Azulene,1, 2, 3, 5, 6, 7, 8, 8A-Octa-hydro, 1, 4-Dimethyl-7-(1-methylethenyl).	28.66	8,623,131	1.69	204	$C_{15}H_{24}$	
4.	(-) Alpha Panasinsen	28.14	6,701,186	1.32	204	$C_{15}H_{24}$	
5.	Ledol	31.57	6,643,249	1.30	222.37	$C_{15}H_{26}O$	

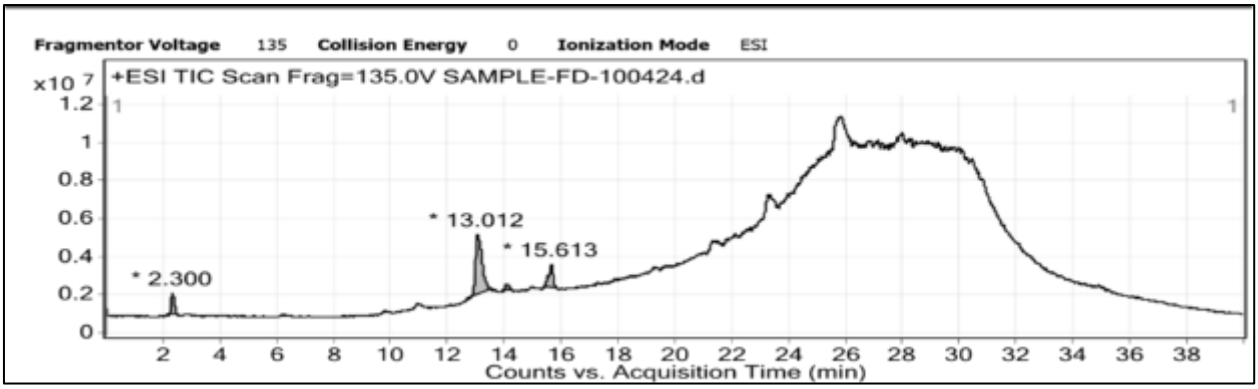
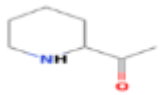
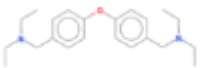
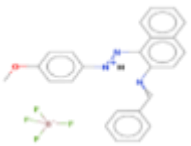


Figure 10 *Pogostemon benghalensis* Four highest peaks of LCMS

Table 9 *Pogostemon benghalensis* Four highest peaks of LCMS

Sl. No.	m/z	Compound name	Formula	Structure
1	127	2-Acetylpiperidine	$C_7H_{13}No$	
2	453.4	Butane,1,1,2,2,3,3,4,4-Octafluoro-1,4-diiodo	$C_4F_8I_2$	
3	340	Benzylamine, 4,4-Oxybis (n,n-diethyl)	$C_{22}H_{32}N_2O$	
4	453.5	2-Naphthylamine, n-benzylidene- 1(P-methoxyphenylazo) hydrogen tetrafluoroborate.	$C_{24}H_{20}BF_4N_{30}$	

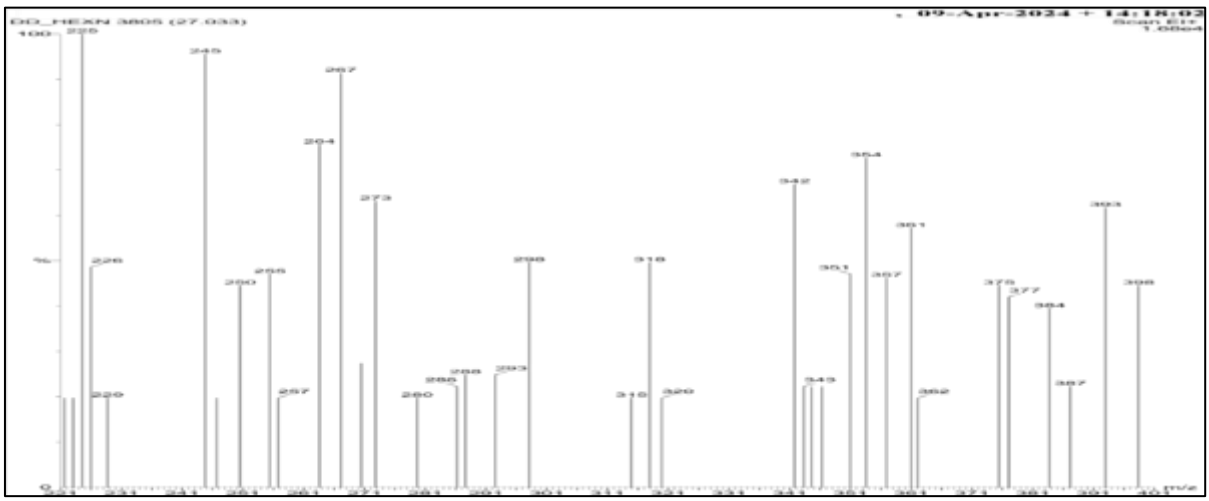
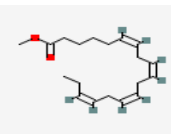
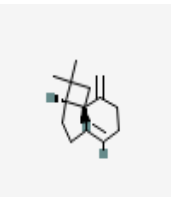
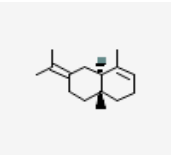
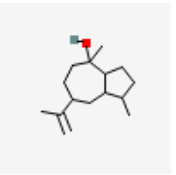


Figure 11 *Pogostemon benghalensis* Five highest peaks of GCMS

Table 10 *Pogostemon benghalensis* Five highest peaks of GCMS

Sl.No.	Compoun name	R.T.	Area	Area%	M.W.(m/mol)	Formula	structure
1	Methyl stearidonate.	28.649	10,829,383	2.520	290	$C_{19}H_{30}O_2$	
2	(1R,9R, E)-4,11,11-Trimethyl-8-Methylenebicyclo [7.2.0] UNDEC-4-ENE	27.178	10,470,669.2	2.437	204	$C_{15}H_{24}$	
3.	Bicycl [7. 2.0] UNDEC-4-ENE,4,11,11-Trimethyl-8-methylene	28.319	10,307,461	2.399	204	$C_{15}H_{24}$	
4.	Selina-3,7(11)-Diene	28.124	6,731,038.5	1.567	204.35	$C_{15}H_{24}$	
5.	1,4-Dimethyl-7-(Prop-1-en-2-yl) Decahydroazulen-4-ol	31.565	4,858,151	1.131	222	$C_{15}H_{26}O$	

5. Conclusion

These five *Pogostemon species* are *Pogostemon cablin, P. heyneanus, P. parviflorus, P. quadriflolius* and *P. benghalensis* are used in ethno-medicine of diarrhea, mosquito repelled, chicken pox, Snake bite, vomiting, Stomachache, cough etc. And also used in Perfume industries, Shampoo, hair lotion, Soap industries. Phytochemical extraction of Five *Pogostemon species* of Manipur was performed by using LCMS & GCMS. Many chemical compounds were found, some valuable compounds were recorded viz., Fluphenazine used medicine of Psychotic disorders and Schizophrenia, sometime 4-Chloroquinoline used anti-malarial drugs, chloroquine, amodiaquine (Table 1); Boldenine is anabolic steroid, which were not used in human; it's used in the horse and other animals for increase red blood cell production, weight gain(Table 2); 2-Mercaptopyridine-N- Oxide used in the medicine of fungal skin infections, Psoriasis, Seborrheic and anti-dandruff shampoo (Table 3); 4-Phenyl-3-butyn-2-one used in the anti-cancer drug, anti-inflammatory drugs, anti-viral drugs (Table 3); 2-Methyl stearidonate used in the medicine of support Cardiovascular nutraceutical reduce inflammation, dietary supplement or improve lipid (Table 10).

Some compounds are used in cosmetic or fragrance and Flavoring industries examples 1-(2H)-Naphthalenone; octahydro-4a-8a-dimethyl-7(1-methylethyl); Aciphyllene; (E)- 1-methyl-4-(6-methyl hept-5-en-2-ylidene) cyclohex-1-ene; Butyl 6,9,12,15-octadecatetraenoate; Aromandendrene; Beta-Longipinene, Alpha-Guaiene etc. Agrochemicals such as 2-Chloro-6-methylpyridine; Benzene (Dichloro methyl) and 2- (P-Nonylphenoxy)-6- (P- phenoxy- benzene) Pyrazine etc. Material polymers industries used 4,4-Dibromoctafluorobiphenyl.

Qualitative and quantitative evaluation of Phytochemicals of *Pogostemon species* having very economic importance of Manipur, it can be used in pharmacologist, soap, perfume, lotion, shampoo industries and ethnomedicine. Some of the

new compounds are worth to be mentioned are: (a) from *Pogostemon benghalensis*- 1-formyl-2,2-dimethyl-3-trans-(3-methyl-but-2-enyl)-6-methylidene-cyc, (b)from *Pogostemon cablin*- (3r,3ar,7r,8as)-3,8,8-trimethyl-6-methyleneoctahydro-1h-3a,7-methanol, (c)from *Pogostemon heyneanus*-naphthalene,1,2,3,5,6,7,8,8a-octahydro-1,8a-dimethyl-7-(1-methylethyl) etc.

Compliance with ethical standards

Disclosure of conflict of interest

All the authors do not have any conflict of interest.

References

[1] Harley, R. M., Atkins S., Budantsev A. L., Cantino P. D., Conn B. J., Grayer R., Harley M. M., Kok R. de, Krestovskaja T. , Morales R., Paton A. J., Ryding O. and Upson T. (2004). Labiatae. *In* Kadereit, J.W. (*ed*.) *The families and genera of vascular plants*. Vol. VII*, Lamiales*. Berlin: Springer. pp. 167-282.

[2] Lawrence, G. H. M. 1951. *Taxonomy of Vascular Plants*. In Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi. Miyazawa, M., Okuno, Y., Nakamura S. and Kosaka H. 2000. Antimutagenic activity of flavonoids from *Pogostemon cablin*. J. Agric Food Chem 48: 642-647.

[3] Cantino, P. D., R. M. and S. J. 1992. Genera of Labiatae: Status and Classification. In R. M. Harley & T. Reynolds (eds.), Advances in Labiate Science.Royal Botanic Gardens, Kew. pp. 511- 522.

[4] Dahlgren, R. 1983. General aspects of angiosperm evolution and macrosystematic. Nord. J. Bot. 3: 119-149.

[5] Bentham, G. 1876. Labiatae. In: *Genera Plantarum* (Bentham, G. and J. D. Hooker, (eds.) 2(2): 1160-1223.

[6] Briquet, J. 1895-1897. Labiatae. In: Die Natürlichen Pflanzenfamilien. *(*A. Engler and K. Prantl (eds.), Wilhelm Engelmann, Leipzig. pp. 183- 375.

[7] Cantino, P. D., Wagstaff S. J. and Olmstead R. G. 1999. *Caryopteris* (Lamiaceae) and the Conflict between Phylogenetic and Pragmatic Considerations in Botanical Nomenclature. Syst.Botany 23 (3): 369-386.

[8] Devi, K.B., Devi, K.M., Singh, S.S. and Singh, P. K. 2024. Phytochemical Screening of Ten Ethnomedicinal Plants of Lamiaceae Family of Imphal Valley Districts of Manipur Northeastern India, JETIR2401376 Journal of Emerging Technologies and Innovative Research (JETIR) 2024 JETIR 11(8): 674-685.

[9] Adams, R.P. 1995. Identification of essential oil components by Gas Chromatography/Quadrupole Mass pectroscopy. Allured Publishing Corporation, Carol Stream, IL.

[10] Bure, C.M. and Sellier, N.M. 2004. Analysis of the essential oil of Indonesian Patchouli (*Pogostemon cablin* Benth.) using GC/MS(EI/CI). Journal of Essential Oil Research, *16*:17-19.

[11] Deguerry, F., Pastore, L., Wu S, C. A., Chappell, J. and Schalk, M. 2006. "The diverse sesquiterpene profile of patchouli, *Pogostemon cablin*, is correlated with a limited number of sesquiterpene synthases". *Archives of Biochemistry and Biophysics*. 454(2): 123–36.

[12] Hu, L.F., Li, S.P., Cao, H., Liu, J.J., Yang, F.Q. and Wang, Y.T. 2006. GC-MS fingerprint of *Pogostemon cablin* in China. Journal of Pharmaceutical and Biomedical Analysis, 42: 200-206.

[13] Junell, S. 1934. Zur Gynäceummorphologie und Systematik der Verbenaceen und Labiaten. Symb. Bot. Upsal. 4: 1-219.

[14] Murugana, R., Mallavarapub, G.R., Padmashreea, K.V. Raoc, R.R. and Livingstoned, C. 2010. Volatile Oil Composition of *Pogostemon heyneanus* and Comparison of its Composition with Patchouli Oil, Natural Product Communications, 5(12): 1961-1964.

[15] Ingrouille, M. and Bhatti, G. 2008. Infrageneric relationships within Pogostemon Desf. (Labiatae). Botanical Journal of the Linnean Society. 128. 159 - 183.