Journal of Pharmaceutical Research International

31(6): 1-6, 2019; Article no.JPRI.52960
ISSN: 2456-9119
(Past name: British Journal of Pharmaceutical Research, Past ISSN: 2231-2919, NLM ID: 101631759)

GC/MS Analysis of n-Hexane and Chloroform Extracts of *Chenopodium murale* Leaves in Iraq

Muthanna Saadi Farhan[1], Amjed Haseeb Khamees[1*], Omar Hussein Ahmed[2] Amani AmerTawfeeq[3] and Yahya Saad Yaseen[4]

[1]Department of Pharmacognosy and Medicinal Plants, College of Pharmacy, University of Baghdad, Baghdad, Iraq.
[2]Department of Pharmacognosy and Medicinal Plants, College of Pharmacy, University of Tikrit, Baghdad, Iraq.
[3]Department of Pharmacy-Pharmacognosy and Medicinal Plants, Ashur University College, Baghdad, Iraq.
[4]Department of Pharmaceutical Chemistry, College of Pharmacy, University of Tikrit, Baghdad, Iraq.

Authors' contributions

This work was carried out in collaboration among all authors. Author MSF designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors AHK and OHA managed the analyses of the study. Author AAT managed the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JPRI/2019/v31i630325
Editor(s):
(1) Rafik Karaman, Professor, Bioorganic Chemistry, College of Pharmacy, Al-Quds University, Jerusalem, Palestine.
Reviewers:
(1) Jacilene Silva, Ceará State University, Brazil.
(2) Senthil Kumar Raju, Swamy Vivekanandha College of Pharmacy, India.
Complete Peer review History: http://www.sdiarticle4.com/review-history/52960

Original Research Article

Received 08 September 2019
Accepted 20 November 2019
Published 27 November 2019

ABSTRACT

Chenopodium murale L. it is an essential annual herbaceous weed belongs to the genus Chenopodium and family Chenopodiaceae. *Chenopodium murale* L. commonly called as nettle leaf goosefoot. Aim of this study is the gas chromatography-mass spectroscopy analysis of chemical constituents of *Chenopodium murale* leaves in two different extracts; n-hexane and chloroform. These extracts contain 37 chemical components which are Monoterpenes, steroids precursor and fatty acids. Furthermore the n- hexane extract revealed about 35.22% of cyclic and acyclic monoterpenoids, fatty acid about 2.07%, also 2.31% of nitrogenous compounds and sterol precursor about 0.41%.

**Corresponding author: E-mail: Pharmacognosy88@gmail.com;*

However the chloroform extract revealed the presence of linolenic acid representing 13.54% and neo menthol representing 18.87%, also the other minor components are carvone oxide (0.27%), alpha- pinene epoxide (1.71%), Trans- Squalene (0.77%) and other minor bioactive components.

Keywords: GC/MS analysis; n-hexane; chloroform extracts; Chenopodium murale leaves.

1. INTRODUCTION

According to the World Health Organization, many people of the world depend on the traditional preparations or remedies of herbaceous source. It is important in the health care and recently used as a source of many potent and powerful drugs [1]. The Chenopodiaceae is a family compromised from 102 genera and 1400 species [2]. In general The genus *Chenopodium* contains collections of weedy herbs nearly more than 200 species native to Europe, America and Asia [3,4]. *Chenopodium murale* L., commonly called as nettle leaf goosefoot, it is an essential annual herbaceous weed that grows in waste places [5,6]. It is green, alternate, broad lobed ad stalked long or short leaves with forked stem [7].

From the phytochemical point of view, the plants of *Chenopodium* L were reported to possess numerous medicinal activity used in popular medicine according to its variety of structural patterns of phytochemicals, theses chemical compounds are primary metabolites such as amino acids and proteins and secondary metabolites [8], such as terpenoids [9,10], sterols [11,12], saponins, [13] alkaloids, [14] vitamins [15], Flavonoids and cumarine [16,17].

A wide range of applications is well-known in folk medicine for treatment of cough, abdominal pain, pulmonary obstruction and have diuretic ad laxative activity [18], as well as It is reputed to be good pharmacological activities of chenopodium species such as anthelmintic, anti-inflammatory activity [19] antimicrobial [20], antioxidant, [21,11], the *Chenopodium* extracts could be used as a readily accessible source of natural antioxidants, and may be used in the pharmaceutical industry and for food supplements production [22], antiviral [23] and hypotension effect [18], analgesic and spasmolytic [24,25].

Essential oils are active natural chemical compound in many medicinal plants, produced by aromatic plants. Considering that the essential oil have a variety uses in, food, cosmetic applications, as well as in perfume industries and in the pharmaceutical products as drugs for the treatment of various diseases. The hydrocarbon monoterpenes and monoterpenes derivatives like alcohols, esters, acetates, and others are secondary metabolites belonging to the terpenes and considered the main constituents of volatile or essential oils which are very important in different pharmacological activity [25-30].

According to phytochemical review the Stigmasterol and its derivatives are very important for synthetic and semi-synthetic compounds for pharmaceutical industry. It acts as a precursor in the synthesis of hormones like progesterone, also acts as an intermediate in the biosynthesis estrogens, cortisone, androgens, and vitamin D3 [31].

2. METHODS

2.1 Plant Material

Fresh leaves *of Chenopodium murale* were collected from the garden of College of Pharmacy/University of Baghdad. The Leaves of plant were air dried at room temperature and powdered using a mechanical grinder.

2.2 Extraction of Crude Extracts

Dried and powdered samples were extracted with solvents have different polarity namely, *n*-hexane and chloroform using partitioned method with water 3 × (1:1). subsequently the extracted fractions were evaporated and concentrated using Heidolph Rotavapor (Germany).

2.3 GC-MS Analysis

GC-MS analysis was carried out on unit Shimadzu GCMS QP2010 apparatus. The extract of the leaves of *chenopodium murale* was injected into the Gas chromatography was the instrument used for GC-MS analysis. It is separated into various constituents with different retention time which are detected by mass spectrophotometer.

The chromatogram a plot of intensity against retention time was recorded by the software attached to it. From the peaks of graph, the

compounds are identified comparing the data with the existing software libraries like NIST, NIST08 and NIST08s. 1 µl of the extract of leaves of *Chenopodium murale* was injected into GC. The injection mode was used split method with linear velocity of 45.4 cm/sec for flow control. The carrier gas used was Helium at a flow rate 1.53 mL//min. The injector temperature was maintained at 250ºC. The pressure of the carrier gas was kept at 100.0kPa. The oven temperature was set at 80ºC to 280ºC with a gradual increment of 8ºC per min.

3. RESULTS AND DISCUSSION

GC-MS chromatogram of the n-hexane extract and the chloroform extract of leaves of *Chenopodium murale* showed different number of peaks that indicate different chemical constituent were identified based to the narrow retention time, peak area and molecular formula.

The results revealed the presence of 37 natural chemical compounds in n-hexane extract of *Cheopodium murale* leaves were identified with different peak area percentage, as shown in Fig. 1. Furthermore, the total amount of identified compounds *was* estimated about 41% of total different chemical constituents which are: alpha.-Limonene diepoxide (18.09%), beta.-Ionone epoxide (5.81%), Beta. Terpineol (1.65%), Citronellol epoxide (0.95%), Carvone oxide (0.46%), Megastigmatrienone (0.44%), Cholesta-8, 24-dien-3-ol, 4-methyl-, 3.beta., 4.alpha. (0.41%), Palmitic acid, beta.-monoglyceride (2.07%), 3,7-Dimethyl-1, 7-octadien-6-ol (8.26%), 2,3-Bis1-methylallylpyrrolidine (1.84%), as seen in Table 1.

Wherefore the cyclic and acyclic monoterpenoids estimated 35.22%, fatty acid about 2.07%, 2.31% of nitrogenous compounds and sterol accounted for 0.41%.

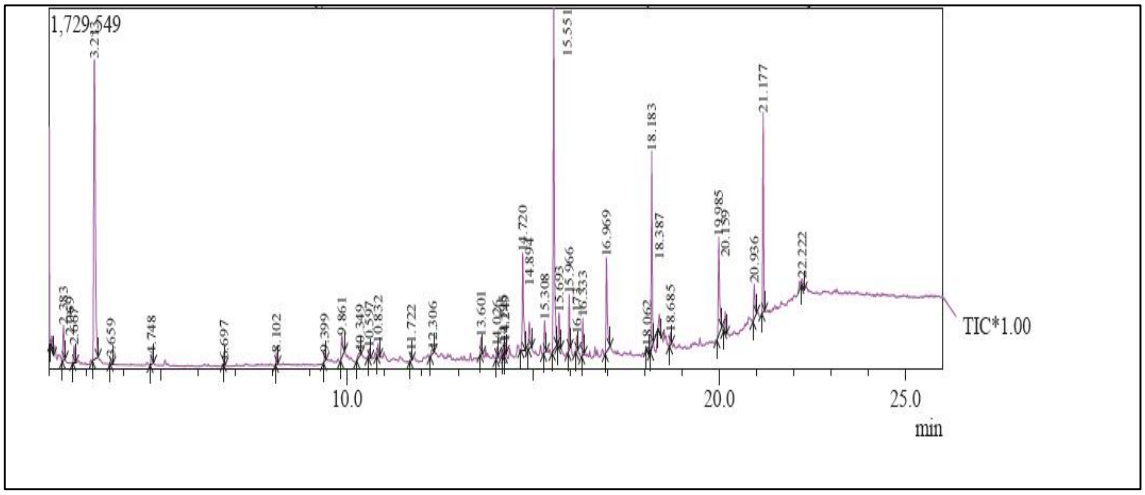

Fig. 1. Gc mass chromatogram of n- hexan extract of *Chenopodium murle* leaves

Table 1. Phytochemical compounds identified in hexane extract of leaves of *Chenopodium murale*

No. of peaks	Name of compound	Retention time	Area %	Molecular weight
17	Cholesta-8,24-dien-3-ol, 4-methyl-, (3.beta.,4.alpha.)	14.026	0.41%	398
18	Megastigmatrienone	14.19	0.44%	190
19	Carvone oxide	14.25	0.46%	166
20	beta.-Ionone epoxide	14.71	5.81%	208
22	Beta. Terpineol	15.3	1.65%	154
23	alpha.-Limonene diepoxide	15.5	18.09%	168
24	2,3-Bis(1-methylallyl)pyrrolidine	15.69	1.84%	179
30	3,7-Dimethyl-1, 7-octadien-6-ol	18.18	8.26%	154
34	Citronellol epoxide	20.15	0.95%	172
35	Palmitic acid .beta.-monoglyceride	20.93	2.07%	330

Identified compounds= 10

However the GC-MS analysis of chloroform extract of leaves of *chenopodium murale* as shown in (Fig. 2) have 37 peaks represent variety of chemical components , from which 21 compounds were identified representing 45.49% of the total components in chloroform extract. Fatty acids and monoterpenes were found to be the major groups of this analysis the dominant constituents were linolenic acid representing 13.54% and neo menthol representing 18.87%, also the other minor components are carvone oxide (0.27%), alpha- pinene epoxide (1.71%), Trans- Squalene (0.77%), pseudoionone (3.3%), alpha-Monopalmitin (1.81), Methyl 12-methyltetradecanoate (1.53), Stearolic acid (0.98), palmitic acid (0.32%), Citronellyl butyrate (0.26%), Oleic acid amide(0.65%), Stearic acid (0.34%), Capric acid (0.36%) and other components as seen in Table 2.

Table 2. Phytochemical compounds identified in chloroform extract of leaves of *Chenopodium murale*

No. of peaks	Name of compound	Retention time	Area %	Molecular weight
6	alpha.-Pinene epoxide	13.3	1.71%	166
7	Carvone oxide	14.7	0.27%	66
8	8-Methyloctahydrocoumarin	15.06	0.13%	168
9	Palmitic acid	15.28	0.32%	256
11	Stearaldehyde	15.9	0.9%	268
12	Pseudoionone	16.0	3.3%	198
13	Citronellyl butyrate	16.17	0.26%	226
14	9-Eicosyne	16.3	0.59%	278
15	Methyl 12-methyltetradecanoate	16.65	1.53%	265
16	(9E,12E,15E)-9,12,15-Octadecatrien-1-ol	16.8	0.65%	264
19	11,14,17-Eicosatrienoic acid, methyl ester	18.07	1.52%	320
20	Neo-Menthol	18.18	18.87%	156
21	Stearolic acid	18.34	0.98%	280
22	alpha.-Linolenic acid	18.40	13.54%	278
23	Capric acid	18.5	0.36%	172
24	Stearic acid	18.6	0.34%	284
26	Cyclohexane-1,2-dimethanol, diacetate	19.4	0.89%	228
27	Oleic acid amide	19.9	0.65%	281.48
30	alpha.-Monopalmitin	20.9	1.81%	330
34	cis,cis,cis-7,10,13-Hexadecatrienal	22.2	2.95%	234
35	trans-Squalene	23.15	0.77%	410.73

Identified compound = 21

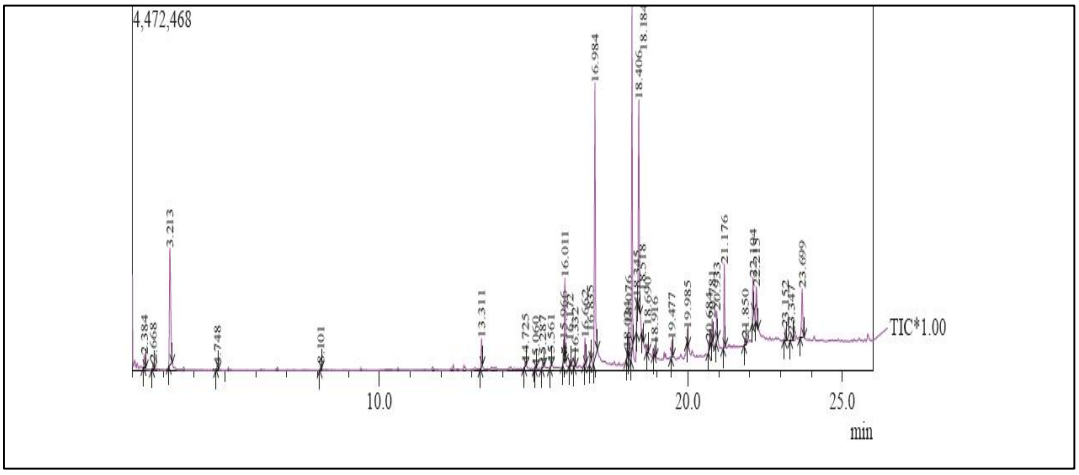

Fig. 2. Gc mass analysis of chloroform extract of *Chenopodium murle* leaves

4. CONCLUSION

According to the findings the GC-MS analysis revealed presence of 37 phytochemical constituents both hexan and chloroform extracts of leaves of *Chenopodium murle*, The important phytochemicals groups present are monoterpenoids, fatty acids and steroids precursor. Therefore *Chenopodium murle* may be used as a source of much pharmacological activity. However further studies will need to be evaluate biological activities of isolated compounds.

CONSENT AND ETHICAL APPROVAL

It is not applicable.

ACKNOWLEDGEMENTS

Financial support of this study by the Research college of Pharmacy University of baghdad is faith fully appreciated.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Gilani AH. Trends in ethnopharmacology. Journal of Ethnopharmacology. 2005; 100(1-2):43-9.
2. Morteza-Semnani K. A review on *Chenopodium botrys* L.: Traditional uses, chemical composition and biological activities. Pharm Biomed Res [Internet]. 2015;1(2):1–9.
[Cited 2019 Aug 22]
Available:http://pbr.mazums.ac.ir
3. Smith BD. Eastern North America as an independent center of plant domestication. Proceedings of the National Academy of Sciences. 2006;103(33):12223-8.
4. Paliwal R. Phytochemical and Pharmacognostical analysis on chenopodium album: A plant with immense antioxidant and nutritional potential. 2015;2(1).
5. Riaz B, Zahoor MK, Zahoor MA, Majeed HN, Javed I, Ahmad A, et al. Toxicity, phytochemical composition, and enzyme inhibitory activities of some indigenous weed plant extracts in fruit fly, *Drosophila melanogaster*. Evidence-based Complement Altern Med;2018.
6. Ahmad B, Jan Q. Phytochemical evaluation of *Chenopodium murale* Linn. Bashir Ahmad, Qasim Jan, Shumaila Bashir, Muhammad Iqbal Choudhary and Muhammad Nisar. Asian Journal of Plant Sciences. 2003;2(15-16):1072-8.
7. Davis PH. No Title [Internet]. Edinburgh University Press. Available:PH Davis - Flora of Turkey, 1965 - cabdirect.org. 1967;567.
8. Kokanova-Nedialkova Z, Nedialkov PT, Nikolov SD. The genus Chenopodium: Phytochemistry, ethnopharmacology and pharmacology. Pharmacognosy Reviews; 2009.
9. Dembitsky V, Shkrob I, Hanus LO. Ascaridole and related peroxides from the genus Chenopodium. Biomed Pap Med Fac Univ Palacky Olomouc Czech Repub; 2008.
10. Singh HP, Batish DR, Kohli RK, Mittal S, Yadav S. Chemical composition of essential oil from leaves of *Chenopodium ambrosioides* from Chandigarh, India. Chem Nat Compd; 2008.
11. Van Rompuy LLL, Zeevaart JAD. Are steroidal estrogens natural plant constituents, Phytochemistry. 1979;18(5): 863–5.
12. Salt TA, Adler JH. Diversity of sterol composition in the family chenopodiaceae. Lipids; 1985.
13. Mizui F, Kasai R, Ohtani K, Tanaka O. Saponins from Brans of Quinoa, *Chenopodium quinoa* Willd I. Chem Pharm Bull; 1988.
14. Hifnawy MS, Ammar HH, Kenawy SK, Zaki ME, Yossef AK, Awaad SA. Phytochemical and biological studies on alkaloidal content of some allergy producing plants growing in Egypt. Bull Fac Pharm; Cairo Univ; 1999.
15. Cutillo F, D'Abrosca B, DellaGreca M, Di Marino C, Golino A, Previtera L, et al. Cinnamic acid amides from *Chenopodium album*: Effects on seeds germination and plant growth. Phytochemistry; 2003.
16. Gohar AA, Maatooq GT, Niwa M. Two flavonoid glycosides from *Chenopodium murale*. Phytochemistry. 2000;53(2):299–303.
17. Ahmed Oh, Hamad Mn, Jaafar Ns. Phytochemical investigation of *Chenopodium Murale* (Family: Chenopodiaceae) cultivated In Iraq, isolation and identification of Scopoletin and Gallic acid. Asian J Pharm Clin Res. 2017;10(11):70-7.

18. Yadav N, Vasudeva N, Singh S, Sharma SK. Medicinal properties of *Genus chenopodium* linn. Indian J Nat Prod Resour; 2007.
19. Ibrahim LF, Kawashty SA, Baiuomy AR, Shabana MM, El-Eraky WI, El-Negoumy SI. A comparative study of the flavonoids and some biological activities of two Chenopodium species. Chem Nat Compd; 2007.
20. Abdel-Aziz MS, Shaheen MS, El-Nekeety AA, Abdel-Wahhab MA. Antioxidant and antibacterial activity of silver nanoparticles biosynthesized using *Chenopodium murale* leaf extract. J Saudi Chem Soc [Internet]. 2014;18(4):356–63. Available:http://dx.doi.org/10.1016/j.jscs.2013.09.011
21. Chludil HD, Corbino GB, Leicach SR. Soil quality effects on Chenopodium album flavonoid content and antioxidant potential. J Agric Food Chem; 2008.
22. Nowak R, Szewczyk K, Gawlik-Dziki U, Rzymowska J, Komsta Ł. Antioxidative and cytotoxic potential of some *Chenopodium* L. species growing in Poland. Saudi J Biol Sci. 2016;23(1):15–23.
23. Okuyama E, Umeyama K, Saito Y, Yamazaki M, Satake M. Ascaridole as a pharmacologically active principle of Paico, a medicinal peruvian plant. Chem Pharm Bull; 1993.
24. García R, Lemus I, Rivera P, Erazo S. Biological and chemical study of paico (*Chenopodium chilense*, Chenopodiaceae). J Ethnopharmacol; 1997.
25. Santos FA, Rao VSN. Antiinflammatory and antinociceptive effects of 1,8-cineole a terpenoid oxide present in many plant essential oils. Phyther Res; 2000.
26. Tawfeeq AA, Mahdi MF, Abaas IS, Alwan AH. Phytochemical and anti-bacterial studies of leaves of *Rosmarinus officinalis* cultivated in Karbala, Iraq. Al-Mustansiriyah Journal for Pharmaceutical Sciences. 2017;17(2):86-94.
27. de Sousa DP, Quintans L, de Almeida RN. Evolution of the anticonvulsant activity of α-terpineol. Pharm Biol [Internet]. 2007; 45(1):69–70. Available:http://www.tandfonline.com/doi/full/10.1080/13880200601028388
28. Wu X, Li X, Xiao F, Zhang Z, Xu Z, Wang H. Studies on the analgesic and anti-inflammatory effect of bornyl acetate in volatile oil from *Amomum villosum*. Zhong Yao Cai; 2004.
29. Tawfeeq AA, Mahdi MF, Abaas IS, Alwan AH. Isolation, quantification and identification of rosmarinic acid, gas chromatography-mass spectrometry analysis of essential oil, cytotoxic effect and antimicrobial investigation of rosmarinus officinalis leaves. Asian J Pharm Clin Res. 2018;11(6):126–32.
30. De Cássia Da Silveira E Sá R, Andrade LN, De Sousa DP. A review on anti-inflammatory activity of monoterpenes. Molecules. 2013;18.
31. Chaudhary J, Jain A, Kaur N, Kishore L. Stigmasterol: A comprehensive review; 2011.

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sdiarticle4.com/review-history/52960