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Identification of different phytochemicals in methanolic extract of *Chenopodium album* (L.) leaf through GC-MS

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Abstract
Chenopodium album (L.) commonly known as Bathua belonging to the family Chenopodiaceae. It is a very common weedy herb. The plants have many medicinal properties being used for the treatment of many diseases like rheumatism, arthritis, burns, dysentery, bleeding piles, splenic disorders etc. Hence the present study deals with the determination of different phytochemical constituents in the methanolic extract of *Chenopodium album* leaf using the GCMS technique. GCMS analysis of methanolic extract of *C. album* leaf reveals the presence of many phytochemicals. Main bioactive compounds are n-Hexadecanoic acid, L-Proline, 5-oxo-, methyl ester, Pidolic Acid, l-Phenylalanine, N-butyryl-, methyl ester, 3,7,11,15-Tetramethyl-2-hexadecen-1-ol, Hexadecanoic acid, methyl ester, 2-Diacetylamino-3-(1H-indol-3-yl)-propionic acid, methyl ester. etc. The present study revealed the presence of many pharmacologically and therapeutically active compounds in the plant which justify the use of the plant in the treatment of many disorders by the traditional practitioners.

Keywords: *Chenopodium album*, GCMS, bioactive compounds, phytochemicals

Introduction
Chenopodium album (L.) of the family Chenopodiaceae belongs to the genus *Chenopodium*. The genus *Chenopodium* includes varieties of weedy herbs (more than 200 species) [1]. The plant is commonly known as Vastuka (Sanskrit) Bathua (Hindi), Chandan betu (Bengali), white goose foot (English), Hancike (Kannad), Chakvat (Marathi) Pappukura (Telgu). It is a fast growing annual herbaceous weedy plant specialy grows on waste lands rich in nitrogen. It is a common weed in the field of wheat, barley, mustard and gram. The herb is also cultivated in agricultural land and gardens. It grows up to the height of 30-80 cm. Stem- rarely slender, glabrous, often striped, green, purple. Leaves-Obtuseor acute, toothed, opposite, 3-7cm long and 3-6 cm broad. Leaves are waxy coated whitish underside. Flowers-radial symmetrical, clusters in spike. Its pollen grains can cause hay fever like allergies [2-3].
Chenopodium is a very common weed. It is commonly used for food. The plant also have many medicinal properties [4]. Fresh tender shoots are used in salad, cooked as Vegitable and are also used as fodder [5]. Leaves are also used in the treatment of influenza, dysentery, bleeding piles, pneumonia and typhoid [4, 6] the weed has sperm immobilizing activity [7]. Leaves of the plant has been found to have antipruritic and antinociceptic [8] property.
In traditional medicinal system it is also used in biliousness, abdominal pain, eye diseases, vata and cough [9]. Leaves decoction is being used for the treatment of rheumatism and arthritis by washing the affected joints. Leaves poultice is used to treat headache [10] and also give soothing effect to the burn. leaves of the plants are used in the treatment of constipation [11].
The plants are also used for the treatment of hepatic disorders and spleen enlargement [12].
At present time, people have started looking towards the ancient medicinal systems like Ayurveda, Siddha, and Unani for the treatment of several diseases because prolonged use of synthetic drugs produces many side effects in patient and are very coastly. Herbal drugs have no side effects and these are also cost effective. In developing countries herbal drugs play an important role in the treatment of several diseases. The ancient Indian literature considered all the plants and plant parts as a potential source of medicinal substences [13].
India is a rich source of medicinal plants. More than 2000 plants are described in ancient Indian medicinal systems like Ayurveda, Unani, Siddha, Homeopathy and Naturopathy [14]. India has first rank in the production of medicinal herbs and is called the botanical garden of the world [15].
The therapeutic properties of medicinal plants are due to the presence of many phytochemicals, secondary metabolites, bioactive compounds like alkaloids, glycosides,

tannins, flavonoids etc [16]. A scientific approach is necessary for the development of herbal drugs. Hence documentation of research work carried out on medicinal plants is necessary [17]. Specific information about the Phytoconstituents present in the specific plant is necessary not only for the discovery of therapeutic agents but it also open the way to develop newer herbal drugs.

Now a days, validation of plant products and plant material plays an important role in the standardization of herbal drugs. Recently GCMS have been widely used for the analysis of phytochemicals existing in the plants.

Materials and Methods

Plant material

Chenopodium album linn were collected in the month of January, from different regions of Kanpur district of U.P. India. Care was taken to select healthy plants.

Leaves are separated and washed thoroughly 2-3 times with running tap water and then with distilled water. Leaves are shade dried at room temperature. After complete drying leaves were converted to fine powder by using electric grinder.

Preparation of methanolic extract

10 gm of powdered plant material was dissolved in 100 ml of methanol to extract crude methanolic extract of *Chenopodium album* leaf. The extract was kept at room temperature for 48 hours, filtered by using Whatman no.1 filter paper and it was dried on water bath until the constant weight with dry mass was obtained.

GC-MS analysis

Now a days, GC-MS research tool have been widely used to determine he phytocomposition of volatiles. GC MS analysis was done by IISER Bhopal. GC-MS analysis was done by Agilent 7890 A GC with 5975 CMS system, an oven temperature from 50-280 c at 4 c/min and held at this temperature for 5 min; inlet and interphase temperature were 250 C and 280 C respectively carrier gas was He at a flow rate of 1.0ml/min(constant flow).0.2 ml sample was injected under split of 20:1 EIMS: electron energy,70eV.intrpretation of mass spectrum GCMS was conducting using data base of NIST, having more than 62000 patterns. The spectrum of the known compounds was compared with the NIST library.

Results and Discussion

The phytochemical compounds present in the methanolic extract of Chenopodium album leaf were identified by Gcms analysis.

GC MS chromatogram of methanolic extract of *Chenopodium album* leaf was shown in fig-1. Totally 48 compounds were identified. 48 phytocompounds with their molecular weight, molecular formula, probability (%), RMF value and MF value were presented in table-1.

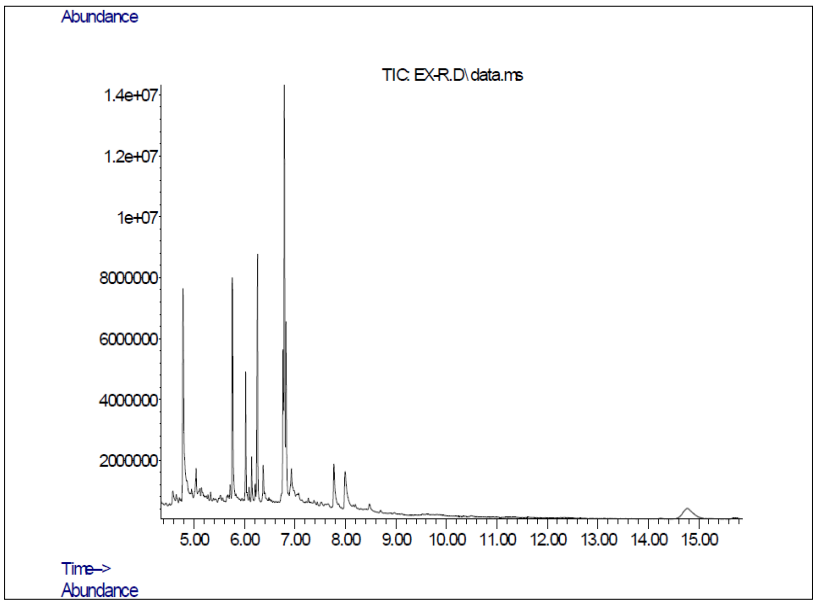

Fig 1: Methanolic extract of Chenopodium album leaf

Table 1: Phytocompounds with their molecular weight, molecular formula, probability (%), RMF value and MF value

Sl. No.	Compound	Mol. form	Mol. Wt	Prob	RMF	MF
1	L-Proline, 5-oxo-, methyl ester	$C_6H_9NO_3$	143	43.8%;	921	915
2	DL-Proline, 5-oxo-, methyl ester	$C_6H_9NO_3$	143	31.8%;	911	906
3	N-Ethyl-2-carbomethoxyazetidine	$C_7H_{13}NO_2$	143	5.11%;	863	841
4	Conhydrin	$C_8H_{17}NO$	143	2.79%;	875	824
5	Pidolic Acid	$C_5H_7NO_3$	129	2.68%;	890	823
6	L-Proline, 1-methyl-, methyl ester	$C_7H_{13}NO_2$	143	2.58%;	901	822
7	L-Phenylalanine, N-acetyl-, methyl ester	$C_{12}H_{15}NO_3$	221	51.1%;	866	840
8	l-Phenylalanine, N-butyryl-, methyl ester	$C_{14}H_{19}NO_3$	249	23.3%;	862	820
9	Phenylalanine, N-isovaleryl-, methyl ester	$C_{15}H_{21}NO_3$	263	6.85%;	828	793
10	N-Formylphenylalanine, methyl ester	$C_{11}H_{13}NO_3$	207	5.52%;	819	788
11	l-Phenylalanine, N-(5-chlorovaleryl)-, methyl ester	$C_{15}H_{20}ClNO_3$	297	4.66%;	826	784
12	l-Phenylalanine, N-caproyl-, methyl ester	$C_{16}H_{23}NO_3$	277	2.92%;	810	770
13	3,7,11,15-Tetramethyl-2-hexadecen-1-ol	$C_{20}H_{40}O$	296	13.3%;	852	717

14	Ethanol, 2-(9-octadecenyloxy)-, (Z)-	$C_{20}H_{40}O_2$	312	10.7%;	720	712
15	Octadecanal, 2-bromo-	$C_{18}H_{35}BrO$	346	6.15%;	699	696
16	Ethanol, 2-(9-octadecenyloxy)-, (E)-	$C_{20}H_{40}O_2$	312	2.98%;	683	677
17	E-8-Octadecacen-1-ol acetate	$C_{20}H_{38}O_2$	310	2.40%;	685	672
18	E-9-Octadecen-1-ol acetate	$C_{20}H_{38}O_2$	310	2.22%;	683	670
19	3,7,11,15-Tetramethyl-2-hexadecen-1-ol	$C_{20}H_{40}O$	296	38.9%;	863	737
20	1,4-Eicosadiene	$C_{20}H_{38}$	278	7.15%;	726	679
21	3-Eicosyne	$C_{20}H_{38}$	278	5.19%;	736	670
22	Bicyclo[10.8.0]eicosane, (E)-	$C_{20}H_{38}$	278	3.87%;	701	662
23	Bicyclo[10.8.0]eicosane, cis-	$C_{20}H_{38}$	278	3.04%;	710	656
24	Ethanol, 2-(9-octadecenyloxy)-, (Z)-	$C_{20}H_{40}O_2$	312	2.92%;	691	655
25	Hexadecanoic acid, methyl ester	$C_{17}H_{34}O_2$	270	69.3%;	848	830
26	Pentadecanoic acid, 14-methyl-, methyl ester	$C_{17}H_{34}O_2$	270	15.6%;	844	788
27	Pentadecanoicacid, 13-methyl-, methyl ester	$C_{17}H_{34}O_2$	270	3.90%;	762	753
28	Hexadecanoic acid, 2-methyl-	$C_{17}H_{34}O_2$	270	0.92%;	754	714
29	Methyl 3-methyl-pentadecanoate	$C_{17}H_{34}O_2$	270	0.84%;	750	712
30	Cyclopentanetridecanoic acid, methyl ester	$C_{19}H_{36}O_2$	296	0.71%;	769	708
31	l-(+)-Ascorbic acid 2,6-dihexadecanoate	$C_{38}H_{68}O_8$	652	41.8%;	757	727
32	n-Hexadecanoic acid	$C_{16}H_{32}O_2$	256	27.8%;	824	715
33	Palmitic anhydride	$C_{32}H_{62}O_3$	494	5.92%;	723	670
34	Isopropyl Palmitate	$C_{19}H_{38}O_2$	298	3.71%;	733	656
35	Eicosanoic acid	$C_{20}H_{40}O_2$	312	3.13%;	713	652
36	i-Propyl 14-methyl-pentadecanoate	$C_{19}H_{38}O_2$	298	3.01%;	743	651
37	9,12,15-Octadecatrienoic acid, methyl ester, (Z,Z,Z)-	$C_{19}H_{32}O_2$	292	29.9%	853	844
38	9,12,15-Octadecatrienoic acid, (Z,Z,Z)-	$C_{18}H_{30}O_2$	278	7.16%;	829	806
39	6,9,12-Octadecatrienoic acid, methyl ester	$C_{19}H_{32}O_2$	292	6.33%;	803	803
40	Butyl 9,12,15-octadecatrienoate	$C_{22}H_{38}O_2$	334	5.10%;	835	798
41	9,12,15-Octadecatrienoic acid, 2,3-dihydroxypropyl ester, (Z,Z,Z)-	$C_{21}H_{36}O_4$	352	4.90%;	809	797
42	Methyl 6,9-octadecadienoate	$C_{19}H_{34}O_2$	294	3.85%;	851	791
43	2-Diacetylamino-3-(1H-indol-3-yl)-propionic acid, methyl ester	$C_{16}H_{18}N_2O_4$	302	43.0%;	784	772
44	2-Acryloylamino-3-(1H-indol-3-yl)propionic acid, methyl ester	$C_{15}H_{16}N_2O_3$	272	38.0%;	809	769
45	N-Acetyl-isotryptophane, methyl ester	$C_{14}H_{16}N_2O_3$	260	11.0%;	782	741
46	Tryptophan, N-[3-carboxypropionyl]-, methyl ester	$C_{16}H_{18}N_2O_5$	318	4.00%;	759	718
47	Methyl 2-[(tert-butoxycarbonyl)amino]-3-(1H-indol-3-yl)propanoate	$C_{17}H_{22}N_2O_4$	318	1.04%;	726	685
48	L-Tryptophan, N-acetyl-, methyl ester	$C_{14}H_{16}N_2O_3$	260	0.96%;	699	683

Prevailing compounds are L-Tryptophan, N-acetyl-, methyl ester, Methyl 2-[(tert-butoxycarbonyl)amino]-3-(1H-indol-3-yl)propanoate, Tryptophan, N-[3-carboxypropionyl]-, methyl ester, N-Acetyl-isotryptophane, methyl ester, 2-Acryloylamino-3-(1H-indol-3-yl)-propionic acid, methyl ester, 2-Diacetylamino-3-(1H-indol-3-yl)-propionic acid, methyl ester, Methyl 6,9-octadecadienoate, 9,12,15-Octadecatrienoic acid, 2,3-dihydroxypropyl ester, 9,12,15-Octadecatrienoic acid, 2,3-dihydroxypropyl ester, (Z,Z,Z)-, 9,12,15-Octadecatrienoic acid, (Z,Z,Z)-, Eicosanoic acid, i-Propyl 14-methyl-pentadecanoate, Isopropyl Palmitate, Palmitic anhydride, n-Hexadecanoic acid, l-(+)-Ascorbic acid 2,6-dihexadecanoate, Cyclopentanetridecanoic acid, methyl ester, Methyl 3-methyl-pentadecanoate, Hexadecanoic acid, 2-methyl-, Pentadecanoicacid, 13-methyl-, methyl ester, Pentadecanoic acid, 14-methyl-, methyl ester, Hexadecanoic acid, methyl ester, Ethanol, 2-(9-octadecenyloxy)-, (Z)-, Bicyclo[10.8.0]eicosane, cis-, Bicyclo[10.8.0]eicosane, (E)-, 3-Eicosyne, 1,4-Eicosadiene, 3,7,11,15-Tetramethyl-2-hexadecen-1-ol, E-9-Octadecen-1-ol acetate, E-8-Octadecacen-1-ol acetate, Ethanol, 2-(9-octadecenyloxy)-, (E)-, Octadecanal, 2-bromo-, Ethanol, 2-(9-octadecenyloxy)-, (Z)-, 3,7,11,15-Tetramethyl-2-hexadecen-1-ol, l-Phenylalanine, N-caproyl-, methyl ester, l-Phenylalanine, N-(5-chlorovaleryl)-, methyl ester, N-Formylphenylalanine, methyl ester, Phenylalanine, N-isovaleryl-, methyl ester, l-Phenylalanine, N-butyryl-, methyl ester, L-Phenylalanine, N-acetyl-, methyl ester, L-Proline, 1-methyl-, methyl ester, Pidolic Acid, Conhydrin, N-Ethyl-2-carbomethoxyazetidineDL-Proline, 5-oxo-, methyl ester, L-Proline, 5-oxo-, methyl ester.

The presence of different phytochemical constituents confirm the use of *Chenopodium* leaf for the treatment of different diseases by traditional practitioners. Hence the plant is a potential folklore medicinal plant. This study is a preliminary study. However, isolation of individual bioactive compound may proceed to find a new herbal drug. Hence the plant serves a potential source of herbal medicines.

Conclusion

In the present study total 48 phytochemicals are identified by GC-MS analysis. The presence of various bioactive phytochemicals confirm the pharmaceutical importance of *Chenopodium album* plant. GCMS profile can be used as biochemical markers for the identification of the mother plant. And by using the GCMS profile adulteration can be identify. However, further study will require for finding individual bioactivity and toxicity profile of these phytochemicals.

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