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In Vitro Anti-Inflammatory and Antioxidant Properties and GC-MS Based Phytoconstituent Screening of Methanolic Fruit (Berry) Extracts of *Gaultheria Trichophylla* Royle

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ABSTRACT

Gaultheria trichophylla fruit was collected from the western part of the Himalayan Mountains of Himachal Pradesh. It belongs to the family Ericaceae. In our research, the inhibition of protein albumin denaturation assay and the DPPH radical scavenging activity were analyzed to reveal the anti-inflammatory and antioxidant effects of *G. trichophylla* methanolic fruit extract. GC-MS analysis and qualitative and quantitative phytochemical analyses were also determined. The preliminary qualitative screening of the fruit extract identified phytoconstituents like alkaloids, flavonoids, phenols, steroids, glycosides, tannins, terpenoids, and saponins. It was found that fruit extract shows 138.88±2.346 total phenolic content and 53.96±2.049 total flavonoid content at the highest concentrations. The fruit extract possessed higher free radical scavenging activity (91.54±0.015) at 250 µg/ml concentration, having an (IC50=23.81) when compared with standard ascorbic acid (73.47±0.020) at 250 µg/ml concentration, with (IC50=136.20) and is statistically significant. The extract also exhibited higher percent inhibition of protein denaturation (82.56±0.008) at 250 µg/ml concentration, having an IC50=120.98, when compared with standard aspirin (76.47±0.014) at 250 µg/ml concentration, having an IC50=65.09 (statistically significant). GC-MS screening revealed 45 therapeutically active phytoconstituents in the extract, out of which 2,3-Dihydro-3,5-dihydroxy-6-methyl-4h-pyran-4-one (15.64%); Hexadecenoic acid (15.19%); Octadec-9-enoic acid (13.78%); 9,12-Octadecadienoic acid (11.04%); 5-Hydroxymethylfurfural (7.81%); 4H-pyran-4-one, 3-hydroxy-2-methyl (7.17%); 4-Oxopentanoic acid (4.07%); 4-Methyl-6-(tetrahydropyran-2-yloxy) hex-4-enal (3.06%); 2-Decenal, (E) (2.82%); and Octadecanoic acid (2.50%) were the bioactive constituents having a high percentage of area in the chromatogram. Thus, we conclude that the fruit extract of *G. trichophylla* can be a powerful source of bioactive phytoconstituents of therapeutic value, anti-inflammatory, and antioxidant agents.

Keywords: *In vitro*; Antioxidant; Anti-inflammatory; *Gaultheria trichophylla*; GC-MS

1. INTRODUCTION

Inflammation is a complicated process that is triggered by harmful stimuli like pathogens, irritants, or damaged cells in vascular tissue. It initiates the healing process of tissues in the organism to get rid of harmful stimuli. However, untreated inflammation triggers the development of diseases like atherosclerosis, rheumatoid arthritis, and vasomotor rhinorrhoea[1].

Inflammation is characterized by redness, swelling, pain, and heat in the injured area with the release of histamines, kinins, and prostaglandins, which collectively cause increased vascular permeability and vasodilation, an increase in membrane modifications, and protein denaturation. Compounds produced from medicinal plants can be used as a substitute drug in treating inflammatory diseases[2].

Low antioxidant levels in our body cause numerous diseases like inflammation, diabetes mellitus, ageing, cancer, neurodegenerative and cardiovascular diseases. Biological molecules are oxidatively damaged by reactive oxygen species (ROS) and give rise to DNA mutation, oxidative damage to lipids, membrane proteins, and disintegration of cell membranes[3]. Antioxidant agents like phenolic compounds and ascorbic acid prevent the oxidation of molecules. Many medicinal plants contain such antioxidant biomolecules, especially plant phytochemicals like phenols, flavonoids, coumarins, lignins, benzoic acid derivatives, etc. which prevent diseases related to oxidative damage[4].

G. trichophylla, (Ericaceae family), often known as Himalayan snowberry or creeping snowberry, is a highly valuable, edible, mat-forming, and wild aromatic plant. It is found at an altitude of 2700-4500 m, growing on rocks and banks in the Himalayas from Pakistan to South-West China, and flowers in May-July. It is a prostrate-spreading dwarf shrublet with branched stems, tiny, opposite, elliptic leaves, triangular sepals, pink, red, or nearly white, bell-shaped flowers, and more distinct sky-blue colour fruit berries. Fruits are edible and are

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especially used for the cure of inflammation and pain-like ailments. Also, fruits possess antioxidant properties. Traditionally, local people use dried branches during religious formalities, and the oil of the leaves treats fractures and swelling[5].

This study's objectives were to quantify the total amount of phenolic compounds and flavonoids in the fruits of *G. trichophylla*. To investigate the extract's anti-inflammatory and antioxidant abilities using *In vitro* techniques. The natural bioactive phytochemicals of the fruit extract were examined and detected by gas chromatography-mass spectrometry (GC-MS) analysis. It could help provide information for the synthesis of a new nutraceutical or drug.

2. MATERIAL AND METHODS

2.1 Gathering and Authentication of the Plant

The collection area for *G. trichophylla* fruit berries was the Great Himalayan National Park (GHNP), District Kullu, H.P., in August 2021. The authentication was done at the Botanical Survey of India (B.S.I.), Northern Regional Centre, Dehradun, Uttarakhand, with the accession number of the plant being 914. The fruits of this plant were washed properly, shade-dried, ground, and kept in an airtight container. About 20 grams powder of dried fruits were mixed in about 180 ml of methanol solvent and incubated on the shaker for one or two days. The plant mixture was then dried using the rotary evaporation technique after being filtered using Whatman filter paper no. 1. The obtained extract was then placed in a refrigerator at 4 ℃ temperature in an airtight bag, which was used for further experiments.

2.2 Qualitative Phytochemical Analysis

Methanolic fruit extract of *G. trichophylla* was analysed for qualitative screening of different phytochemical constituents like phenols, flavonoids, terpenoids, tannins, steroids, saponins, glycosides, and alkaloids. Various protocols of tests were carried out to know the occurrence of bioactive phytochemicals in the fruit extract, like alkaloid (Mayer's test), glycoside (Keller-Killani test), flavonoid (Alkaline reagent test), phenol, and tannin (FeCl3 test), terpenoid (Salkowski test), and saponin (Froth test)[6,7]

2.3 Determining the Total Amount of Phenolics

It was assessed by the reagent Folin Ciocalteu (FC) by using standard gallic acid (GA)[8]. The reaction mixture was prepared by mixing fruit extract (2 ml), which was taken at various concentrations (50-250 µg/ml) and 10% FC reagent (2.5 ml). After 5 minutes add 7.5% Na2CO3 (2.5 ml) to each test tube. This mixture was then incubated at 45ºC for 1 hr. Blue-coloured complex was synthesized by the redox reaction of the reagent. The absorbance at 765 nm was calculated spectrophotometrically. Values of extract were evaluated as GA equivalent (mg) per extract (gm), and phenolic concentration was estimated with the help of a calibration curve.

2.4 Determining the Total Content of Flavonoids

It was assessed by using the quercetin standard (AlCl3 colorimetric assay)[9]. In the assay, 2 ml of fruit extract (50-250 µg/ml), 0.1 ml of 10% AlCl3, 0.1 ml of 1M CH3CO2K, and 2.3 ml of 80% methanol were added to make a 3 ml final volume. After mixing, the sample's incubation period was half an hour at 37ºC. The absorbance was calculated spectrophotometrically at 420 nm. With the help of the calibration curve, total flavonoid content can be assessed, and values of extract were evaluated as quercetin equivalent (QE) (mg) per extract (gm).

2.5 Determination of *In Vitro* Antioxidant Property

DPPH (1, 1- diphenyl-2-picrylhydrazyl) assay

The extract was assessed for its scavenging ability for DPPH free radicals. The standard for the experiment was ascorbic acid, the positive control was DPPH, and the blank was methanol[10]. 2 ml of different aliquots of methanolic fruit extract that are 50 µg/ml to 250 µg/ml (2 mg of fruit extract was liquified in 2 ml dimethyl sulfoxide) were added to the test tubes, and then 2.7 ml of methanolic DPPH solution was poured into each test tube. Dark conditions were maintained. Absorbance was calculated spectrophotometrically at 517 nm after 30 minutes. The inhibition percentage was enumerated by the formula:

$$\% \text{ inhibition} = \left[\left(Ab\hat{} - Ab\hat{}\hat{}\right) / Ab\hat{} \times 100\right]$$

Here in the formula, Ab^ is methanol absorbance, and Ab^^ is standard or extract absorbance.

2.6 Study of Anti-Inflammatory Properties by *In Vitro* Method

Inhibition of protein denaturation assay

A reaction mixture that contained 2 ml of fruit extract (different concentrations: 50 to 250 µg/ml) and 2% protein bovine albumin fraction (aqueous solution) was poured into test tubes. To adjust the pH (6.3) of the mixture, some drops of 1 N HCl were added. The sample incubation period was 20 min. at 37ºC, then heated for 20 min. at 57ºC. Measured turbidity with the help of a spectrophotometer at 660 nm after cooling the samples[11]. The formula used to calculate the percentage inhibition is given below:

$$\% \text{ inhibition} = \left[\left(Ab\hat{} - Ab\hat{}\hat{}\right) / Ab\hat{} \times 100\right]$$

The test was carried out three times (n = 3).

2.7 Statistical Investigation

Each experiment was run three times. The outcome was demonstrated as the mean ± standard error of the mean (SEM) calculated by MS Excel (2016). The IC50 value was calculated with the help of a regression curve using MS Excel. ANOVA (analysis of variance) and Tukey (post-hoc analysis) were carried out using SPSS software version 16.0 to determine the significance level ($P<0.05$).

2.8 GC-MS Analysis

It was done with the GCMS-QP 2010 Ultra spectrophotometer equipped with an RTX 5MS 30m, 0.25mm, 0.25µm GC capillary column. The oven temp. was set at 70º C (5 minutes hold time) to 310º C (10 minutes hold time). The inert gas helium was used in the analysis. The injection temperature and volume taken were 250º C and 1.0µL. The sampling time was 1 minute, and the total running time of the GC-MS was 1 hour for the extract. By comparison with the known bioactive compounds, unknown phytoconstituents can be found based on the retention time, molecular weight, and CAS number. The database of known bioactive compounds can be accessed from the NIST (National Institute of Standards and Technology) research library.

3. RESULTS AND DISCUSSION

3.1 Screening of Phytochemicals–A Qualitative Method

Different phytoconstituents were found by the qualitative analysis of the *G. trichophylla* fruit extract (Table 1). Different phytoconstituents in plants help treat various diseases. Tannins have antioxidant properties that can cure cardiovascular diseases and cancer[10]. Alkaloids have antiarrhythmic, anticholinergic, analgesic, vasodilator, antitumor, and antihypertensive properties[12]. Glycosides have analgesic, anti-arrhythmic, cardiotonic, purgative, and demulcent actions[13]. Terpenoids show anti-inflammatory properties[14]. Saponins exhibit properties like anti-inflammatory, anticancer, cytotoxic, antiviral, antifungal, and antibacterial[15]. The qualitative study signifies that *G. trichophylla* fruit is rich in phytochemicals that possess numerous therapeutic properties.

Table 1. Screening of phytochemical constituents of *G. trichophylla* fruit extract

Phytochemical constituents	Presence or absence of phytochemical constituents in the extract
Alkaloids	Present
Glycosides	Present
Phenols	Present
Flavonoids	Present
Tannins	Present
Steroids	Absent
Terpenoids	Present
Saponins	Present

3.2 Quantitative Study of Phenolics and Flavonoids

TPC(total phenolic content) of fruit extract is calculated by GA Equivalent (mg) per extract (g), and TFC(total flavonoid content) is expressed by QE (mg) per extract (g). Both are calculated by the standard curve equations (y = 0.004x – 0.0849, R2 = 0.9628) and (y = 0.0043x + 0.2346, R2 = 0.9904). Due to their redox characteristics, phenolic substances serve as antioxidants. The antioxidant activity can be estimated by total phenolic content as hydroxyl groups facilitate the scavenging of free radicals. The flavonoid's antioxidant activity is determined by the existence of free OH groups (mainly 3-OH)[8]. The flavonoids have anti-inflammatory, antioxidant, anticancer, and antimicrobial properties[16]. In the current investigation, it was found that TPC and TFC are, respectively, 138.88±2.346 and 53.96±2.049 at the greatest concentration (250 g/ml) as shown in Table 2 given below. Thus, the methanolic fruit extract of *G. trichophylla* possesses an ample content of phenolic compounds and flavonoids, suggesting its use in many herbal medicines.

Table 2. Phenolics and flavonoids total content of *G. trichophylla* fruit extract

Concentration (µg/ml)	TPC (GA equivalent/ extract)	TFC (quercetin equivalent/ extract)
50	29.76±0.183*	13.34±0.354*
100	37.72±0.629*	24.19±1.479*
150	44.47±0.629*	41.17±1.025*
200	76.47±3.605*	48.22±2.292*
250	138.88±2.34*	53.96±2.049*

*Values indicate mean ± SEM of three replicates (n=3)

3.3 Estimation of Antioxidant Potential

The capacity of *G. trichophylla* fruit extract to scavenge free radicals was calculated by the percentage inhibition formula. The methanolic (whole plant) extract of *G. trichophylla* had the highest percentage of inhibition in a prior investigation, according to Alam, F. *et al.* (2017), followed by chloroform, and hexane extracts (90.5%, 66.8%, and 58.9%) at the concentration of 0.5 mg/ml17. In our study, the % inhibition at 250 µg/ml was found to be 91.54±0.015 for fruit extract with an IC50 value of 23.81 and 73.47±0.020 for ascorbic acid with an IC50 of 136.20, which was used as standard (Table 3). In the present study, fruit extract shows a statistically significant and better percentage of inhibition in comparison to ascorbic acid, suggesting the potent antioxidant property of the fruits of *G. trichophylla*. By the comparison of our study with the previous one by Alam *et al*., (2017), fruit extract shows better percent inhibition than the whole plant extract of *G. trichophylla*. The fruits of *G. trichophylla* contain numerous bioactive phytoconstituents, which GC-MS research reveals are present and may be the source of the plant's antioxidant activity.

Table 3. Inhibition percentage by the fruit extract of *G. trichophylla* and the standard

Concentration in µg/ml	Plant extract % inhibition	Ascorbic acid % inhibition
50	54.59±0.021*	32.56±0.100*
100	62.91±0.023*	41.55±0.033*

150	76.84±0.008*	52.57±0.047*
200	84.13±0.010*	64.26±0.032*
250	91.54±0.015*	73.47±0.020*
IC_{50} value	23.81	136.20

* Values are found significant in the statistical test P<0.05) and represent mean ± SEM (n=3).

3.4 Estimation of Anti-Inflammatory Property

The capacity of *G. trichophylla* fruit for reducing inflammation was investigated in the current study using an assay of protein denaturation inhibition. As per our knowledge, no previous studies were conducted on this protocol for determination of the anti-inflammatory potential of *G. trichophylla* fruit extract. Though in a previous study, Alam, F. *et al.* (2017) disclosed the maximum lipoxygenase inhibition by methanolic extract (whole plant) of *G. trichophylla* as compared with chloroform and hexane extract. At 0.5 mg/ml (or 500 µg/ml) concentration, methanolic, chloroform, and hexane extracts inhibited lipoxygenase activity by 90.5 %, 66.9%, and 57 %. Extracts of *G. trichophylla* exhibit anti-inflammatory activity by inhibiting enzyme lipoxygenase (LOX) as these are correlated with allergic and inflammatory reactions due to the leukotriene formation[17].

In our study, the inhibition percentage at 250 µg/ml concentration was found to be 82.56±0.008 with an IC50 value of 120.98 for the extract and 76.47±0.014 with an IC50 value of 65.09 for aspirin, a standard anti-inflammatory drug. Thus, our finding displays that fruit extract of *G. trichophylla* shows a statistically significant and better ability to inhibit protein denaturation when compared to standard and the previous study by Alam, F. *et al.* (2017) and suggests its usage in making anti-inflammatory drugs that can cure many inflammatory disorders (Table 4). According to the results of the GC-MS study, many bioactive phytoconstituents present in *G. trichophylla* fruits may be responsible for their anti-inflammatory potential.

Table 4. % inhibition of protein denaturation by *G. trichophylla* fruit extract and standard aspirin

Concentration (µg/ml)	% Inhibition by Plant extract	% Inhibition by aspirin
50	32.87±0.005*	47.68±0.020*
100	44.06±0.008*	54.26±0.020*
150	56.56±0.005*	64.13±0.029*
200	71.70±0.003*	68.08±0.028*
250	82.56±0.008*	76.47±0.014*
IC_{50} value	120.98	65.09

*Each value indicates the mean ± SEM (n=3) and statistical analysis determined that the results were significant (P<0.05).

3.5 GC-MS Analysis

The chromatogram (Fig. 1) represents the relative concentration of different phytoconstituents present at various peak heights. The compounds were recognized by their elution at different times in the mass spectrometric analysis. Through the GC-MS analysis, 45 bioactive phytoconstituents were recognized in the methanolic fruit extract of *G. trichophylla* listed in Table 5, as confirmed through the NIST data library. Out of these 45 compounds, some biologically active compounds identified in the extract responsible for having different therapeutic activities have been mentioned below. It has been reported that 4H-pyran-4-one, 3-hydroxy-2-methyl[18], Pluchidiol, and Hexadecanoic acid[19] show anti-inflammatory, and antioxidant activities; Octanoic acid has anti-inflammatory, and antifungal potential[20]; 2,3-Dihydro-benzofuran possesses anti-inflammatory, antibacterial, and antiviral activities[21]; 5-Hydroxymethylfurfural exhibits anti-inflammatory, antioxidant, and antiproliferative properties[22]; Dodecanoic acid exhibits properties like anti-inflammatory, cyclooxygenase-1 and cyclooxygenase-2 enzymes inhibitor, antioxidant, anticancer, prevents hypo-cholesterolemia[23], antibacterial, antiviral, antimicrobial, and antifungal activities[24]; Hexadecanoic acid, methyl ester exhibits antioxidant, antiviral and anticancer activities[25]; 9,12-Octadecadienoic acid (Z,Z), methyl ester prevents eczema, inflammation, hypo-cholesterolemia and inhibits the effects of histamine[26]; 9,12-Octadecadienoic acid (Z,Z) prevent inflammation, cancer, eczema, arthritis and shows anti-histaminic, hepatoprotective, 5-alpha reductase inhibitor activity, anti-androgenic, antiacne, and anti-coronary activities[18]; n-Tetracosanol-1 have antioxidant activity[27], antibacterial, antimutagenic activity and enhances immune functions[28]; 1-Heptacosanol possesses excellent antioxidant properties[29]; Stigmast-5-en-3-ol, (3.β.,24S) exhibits antidiabetic, antimutagenic, anthelminthic, anti-cancer, anti-microbial, antifungal properties, and prevents inflammation and oxidative stress[30]; and 2-Decenal, (E) possess nematicidal[31], antibacterial and antifungal activities[32]. Thus, this study reveals that *G. trichophylla* fruit contains many bioactive compounds possessing numerous therapeutic properties, which can be further used in pharmaceutical industries for preparing herbal medicines.

4. CONCLUSION

Therefore, the study's findings indicate that *G. trichophylla* fruit extract exhibits better anti-inflammatory and antioxidant potential (statistically significant) when compared to standard aspirin and ascorbic acid. GC-MS analysis unveiled 45 phytoconstituents in the fruit extract of the plant. As far as we know, no previous studies revealed the GC-MS analysis and anti-inflammatory potential of *G. trichophylla* fruits. Fruits are edible and can be used for making food supplements, juice, jam, etc. They are extremely nutritious, containing an ample content of polyphenols, flavonoids, and antioxidants.

Table 5. Bioactive phytoconstituents identified in the *G. trichophylla* fruit extract (GC-MS)

Peak No.	Retention Time (min.)	Compound Name	Molecular Formula	Molecular Weight	Area %
1	10.699	4H-PYRAN-4-ONE, 3-HYDROXY-2-METHYL	$C_6H_6O_3$	126.11	7.17
2	12.441	4-OXOPENTANOIC ACID	$C_5H_8O_3$	116.11	4.07
3	12.805	2,3-DIHYDROXY-3,5-DIHYDROXY-6-METHYL-4H-PYRAN-4-ONE	$C_6H_8O_4$	144.12	15.64
4	13.718	OCTANOIC ACID	$C_8H_{16}O_2$	144.21	1.70
5	14.924	2,3-DIHYDROBENZOFURAN	C_8H_8O	120.15	0.77
6	15.433	5-HYDROXYMETHYLFURFURAL	$C_6H_6O_3$	126.11	7.81
7	15.600	4-METHYL-6-(TETRAHYDROPYRAN-2-YLOXY) HEX-4-ENAL	$C_{12}H_{20}O_3$	212.29	3.06
8	16.154	2-DECENAL, (E)	$C_{10}H_{18}O$	154.25	2.82
9	16.300	2,3-DIHYDROXYPROPYLACETATE	$C_5H_{10}O_4$	134.13	0.99
10	17.143	2,4-DECADIENAL, (E, E)	$C_{10}H_{16}O$	152.23	0.32
11	17.842	2,4-DECADIENAL, (E, E)	$C_{10}H_{16}O$	152.23	0.53
12	19.154	2-UNDECENAL	$C_{11}H_{20}O$	168.28	0.15
13	20.155	DODECANE	$C_{12}H_{26}$	170.33	0.24
14	22.547	9-OXONONANOIC ACID	$C_9H_{16}O_3$	172.22	1.35
15	24.455	DODECANOIC ACID	$C_{12}H_{24}O_2$	200.31	0.28
16	25.180	CYCLOPROPANEOCTANOID ACID, 2-HEXYL-, METHYL ESTER	$C_{18}H_{34}O_2$	282.5	0.17
17	26.624	9-OCTADECENOID ACID (Z)	$C_{18}H_{34}O_2$	282.5	1.50
18	26.928	FURAN-2-OCTYL	$C_{12}H_{20}O$	180.29	0.17
19	29.162	TETRADECANOIC ACID	$C_{14}H_{28}O_2$	228.37	0.14
20	29.888	PLUCHIDIOL	$C_{13}H_{20}O_2$	208	0.27
21	32.686	HEXADECANOIC ACID, METHYL ESTER	$C_{17}H_{34}O_2$	270.45	0.74
22	33.302	DIBUTYL PHTHALATE	$C_{16}H_{22}O_4$	278.34	0.39
23	33.671	HEXADECANOIC ACID	$C_{16}H_{32}O_2$	256.4	15.19
24	36.044	9,12-OCTADECADIENOIC ACID (Z, Z)-METHYL ESTER	$C_{19}H_{34}O_2$	294.47	1.07
25	36.178	7-OCTADECENOIC ACID, METHYL ESTER	$C_{19}H_{36}O_2$	296.5	1.37
26	36.687	OCTADECANOIC ACID, METHYL ESTER	$C_{19}H_{38}O_2$	298.51	0.15
27	37.075	9,12-OCTADECADIENOIC ACID (Z, Z)	$C_{18}H_{32}O_2$	280.4	11.04
28	37.187	OCTADEC-9-ENOIC ACID	$C_{18}H_{34}O_2$	282.46	13.78
29	37.527	OCTADECANOIC ACID	$C_{18}H_{36}O_2$	284.48	2.50
30	39.624	CYCLOPENTADECANONE	$C_{15}H_{28}O$	224.37	0.15
31	39.893	BETA-H-PREGNA	$C_{21}H_{36}$	288.5	0.33
32	40.704	1,3-CYCLOHEXADECANEDIONE, 6-NITRO	$C_{16}H_{27}NO_4$	297	0.27
33	40.833	2-BUTYL-3-METHYL-5-(2-METHYLPROP-2-ENYL) CYCLOHEXANONE	$C_{15}H_{26}O$	222.37	0.15
34	42.129	OCTADECANOL	$C_{18}H_{38}O$	270.5	0.12

35	43.165	N-NONADECANOL-1	$C_{19}H_{40}O$	284.5	0.15
36	43.788	1,2-BENZENEDICARBOXYLIC ACID	$C_{24}H_{38}O_4$	390	0.11
37	45.415	OCTADECANOL	$C_{18}H_{38}O$	270.5	0.12
38	46.369	N-TETRACOSANOL-1	$C_{24}H_{50}O$	354.65	0.65
39	47.615	OCTADECANOIC ACID, 2-PROPENYL ESTER	$C_{21}H_{40}O_2$	324.5	0.13
40	48.468	OCTADECANAL	$C_{18}H_{38}O$	270.5	0.14
41	49.355	1-HEPTACOSANOL	$C_{27}H_{56}O$	396.73	0.27
42	51.839	CHOLESTA-4,6-DIEN-3-OL, (3B)	$C_{27}H_{44}O$	384.6	0.21
43	52.148	1-EICOSANOL	$C_{20}H_{42}O$	298.32	0.10

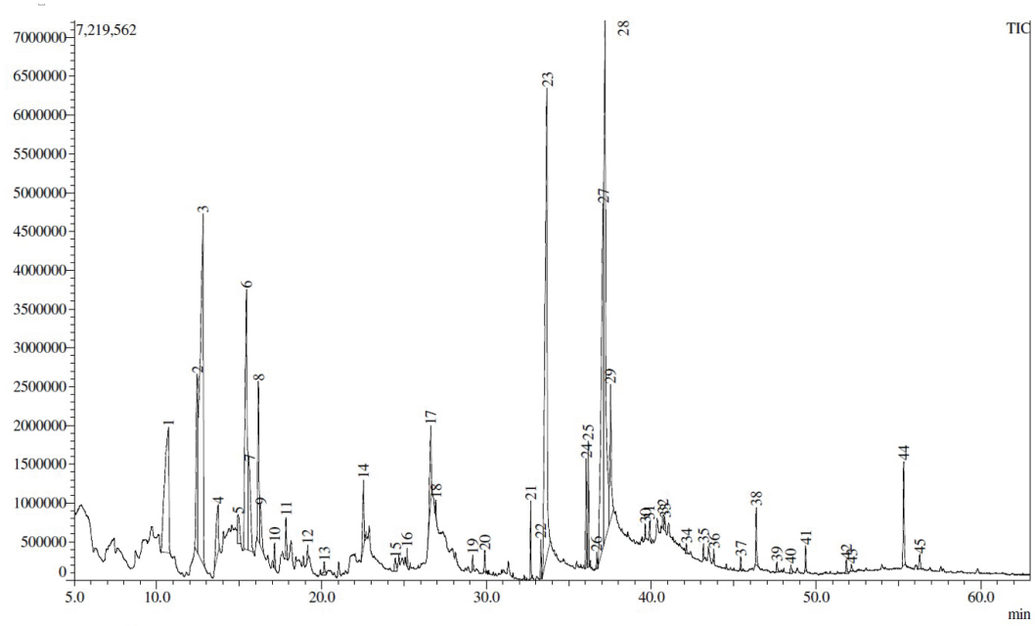

Figure 1. *G. trichophylla* fruit extract chromatogram

They have therapeutic value too, which may be due to the presence of active constituents. Our research findings could be helpful in the preparation of pharmaceutical drugs in the future and the bioactive phytoconstituents present in the fruit can manage and treat oxidative stress and inflammatory conditions.

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