Indian J. Applied & Pure Bio. Vol. 40(2), 1511-1519 (2025). **ISSN: 0970-2091**
A Web of Science Journal

Major Phytochemicals of Three Common Medicinal Edibles of Himachal Pradesh

Dhiraj S. Rawat*[1], Sheetal[1] and Anjna D. Kharwal[2]

[1]Department of Biosciences, Himachal Pradesh University-Shimla - 171005 (India)
[2]Department of Botany, Post Graduate College, Dharamshala - 176215 (India)
*Corrosponding Author- rawatdhirajhpu@gmail.com

Abstract

This study investigates the phytochemical profiles of three medicinal edibles, namely *Urtica dioica*, *Murraya koenigii* and *Bauhinia variegata* using Gas Chromatography-Mass Spectrometry (GC-MS) analysis. The selected plants are traditionally used in various cultures for their therapeutic properties. The plant samples were collected from the selected locations of Himachal Pradesh. The GC-MS analysis revealed a diverse range of bioactive compounds which are known for their potential medicinal benefits. Some of the major compounds includes Phytol, Koenimbin, Hexadecanoic acid, Mahanimbine, µ§-Bisabolene, Heptacosane etc. The findings suggest that these plants possess significant phytochemical diversity which may contribute to their traditional medicinal uses. This research underscores the potential for further exploration of these ethnomedicinal edibles as sources of new pharmaceuticals and natural products.

Key words : Medicinal plants, Traditional knowledge, Herbal remedies, Phytochemistry, GC-MS analysis.

The Himalayan mountains are a treasure trove of remarkable therapeutic plants that have long been integrated into traditional medical practices globally. Many of these plants have been cataloged in various Himalayan regions of India, sparking enthusiasm among the scientific community[8]. Recently, alternative and complementary healthcare systems, including Ayurveda, have gained significant traction in many Western countries and are now recognized by the World Health Organization as valuable treatment modalities for human health. These systems continue to play a vital role in human healthcare due to their economic affordability and accessibility for individuals across all social strata[9]. According to World Health Organization (WHO), about 80% of world's population relies on traditional primary healthcare in the developed countries and even in the developing countries[4]. The escalating occurrence of adverse drug reactions and side effects from pharmaceuticals is leading to a

notable increase in interest in conventional medicine[6].

Ethnomedicine is practiced by numerous ethnic communities worldwide, with India holding a wealth of ancient knowledge regarding medicinal plants. This traditional wisdom has been passed down through generations for millennia. Nevertheless, the emergence of modern medicine has caused a reduction in the prevalence of traditional, alternative and complementary healing practices, emphasizing the necessity to revive these systems through thorough documentation and investigation[7]. Plant-derived products have been integral to phytomedicines for centuries. These products can be obtained from various parts of the plant such as leaves, flower, bark, fruits, seeds and roots. Gaining insight into the chemical constituents of plants is important, as this knowledge can facilitate the synthesis of intricate chemical substances[10].

Plants synthesize a variety of complex phytochemicals that serve various functions including nutrition, stress defense, pest deterrence and pollination facilitation. These phytochemicals have proven beneficial to human health because of their medicinal properties[1]. This suggests that a focus on phytochemicals, supported by ethno-pharmacological insights, is essential for new drug discovery and combinatorial chemistry advancements[3]. It is an undeniable fact that approximately 70% of modern pharmaceuticals are derived from plants or have their origin in natural products[2]. Hence, it is prudent to screen plant species for new drug development by analyzing their chemical constituents and establishing a scientific basis for their traditional uses. The present study endeavors to evaluate the medicinal significance of *Urtica dioica, Murraya koenigii and Bauhinia variegata* in terms of its phytochemical potential through GC-MS analysis.

Collection of plant material :

The plant specimens were collected from the selective regions of Himachal Pradesh and later got identified and authenticated at HFRI-Shimla. The collected samples were then cleaned carefully with gentle dusting followed by washing with running water. Then the samples were pat dried using tissue paper and allowed to air dry at room temperature, avoiding direct sunlight exposure to prevent any potential UV damage. The samples were then finally homogenized into a fine powder and stored in an airtight container with proper labeling for preparation of extract for further GC-MS analysis following the method outlined by Hubschmann[5].

Preparation of plant extract :

Acetone and methanol were selected as solvents for the preparation of extract. The plant extracts were prepared by using a cold percolation method. For the preparation of different extracts, 5 g of powdered plant part is mixed in 10 ml of solvent (acetone and methanol) and maintain it at room temperature for seven days with gentle shaking occasionally. The supernatant was filtered through Whatman filter paper No. The filtrate was then stored in eppendorf tubes for subsequent GC-MS analysis.

Observation :

Three common medicinal edibles were selected from the study area for the

phytochemical analysis:

***Urtica dioica* L.**

Syn. : *U. pilufera* L.; *U. galeopsifolia* Wierzb. *ex* Opiz

Family: Urticaceae

Vern. Name : Bichhubuti

Description : This herb can reach a maximum height of upto 2 meters. Leaves are arranged oppositely along the stem and have cordate base with tapering tip and serrated margin. Flowers are small, greenish or brownish and grow in dense whorled clusters at the tips of the stems and axils of the leaves. Both stems and leaves are obscured with numerous stinging and non-stinging trichomes. The fruits are small achenes with numerous seeds.

Flowering & Fruiting : August-October

Part Used : Leaves

Folk use : Anthelmintic, emmenagogue, astringent, galactagogue, analgesic, rubefacient, diuretic, stimulant, tonic and rubefacient.

***Murraya koenigii* (L.) Spreng.**

Syn.: *Bergera koenigii* L.; *Chalcas koenigii* (L.) Kurz.; *M. foetidissima* Teijsm & Binnend

Family: Rutaceae

Vern. Name : Kaddipatta, Gandhela

Description : It is a small shrub that grows to about 2.5 meters in height. Leaves are bipinnately compound with reticulate venation and exstipulate. Stem is either dark green or brownish. Flowers are white, bisexual, sweet-scented, funnel-shaped and have stalks. The inflorescence appears as a terminal cyme. Fruits are glossy black and can be either round or oblong, each containing one seed.

Flowering & Fruiting : February-April

Part Used : Aerial parts

Folk use : Febrifuge, carminative, antidiabetic, antispetic, purgative, vermicidal, stomachic, antidiarrhoeal, stimulant, appetizer and blood purifier.

***Bauhinia variegata* L.**

Syn.: *B. candida* Roxb.; *B. chinensis* (DC.) Vogel; *B. decora* Uribe; *B. purpurea* Wall.; *Phanera variegata* (L.) Benth

Family: Fabaceae

Vern. Name : Kachnar, Karyale

Description : A medium- sized deciduous tree characterized by brownish-grey bark that is fissured and stout branchlets that are glabrescent. Leaves are simple, nearly circular, caducous with a glaucous underside and have heart-shaped base and rounded lobes. Flowers are vareigated, either white or bright pink. The fruit is a flat pod.

Flowering & Fruiting : March-July

Part Used : Flower buds

Folk use : Laxative, galactogogue,

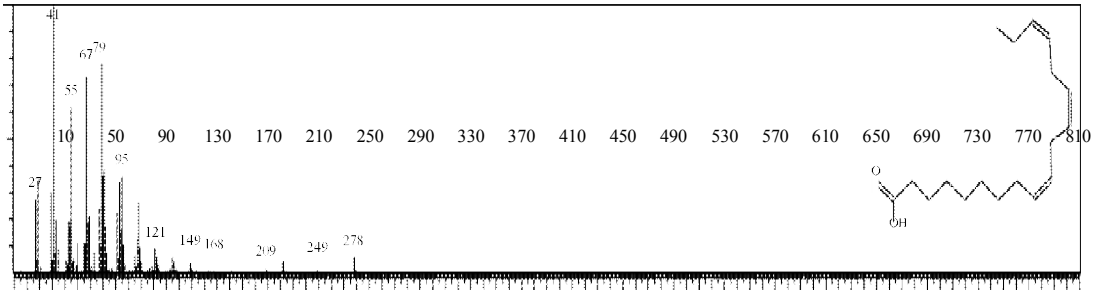
astringent, anthelmintic, vermifuge, tonic, purgative, culminative, blood purifier, anti inflammatory, antidote and appetizer.

Gas chromatography-mass spectrometry (GC-MS) of leaves of *Urtica dioica*, aerial parts (leaves) of *Murraya koenigii* and flower buds of *Bauhinia variegata* was carried out. Chromatogram of GC-MS analysis of acetone extract of *Urtica dioica* leaves shows 38 peaks for 26 compounds. The major compounds as depicted by high peak area percentage are phytol, 9, 12, 15-octadecatrienoic acid, (Z, Z, Z) and stigmast-5-en-3 β-ol. Similarly, chromatogram of GC-MS analysis of methanol extract of *Urtica dioica* leaves shows 31 peaks for 30 compounds. The major compounds as depicted by high peak area percentage are 2-(isobutoxymethyl) oxirane, 9, 12, 15-octadecatrien-1-ol, (Z, Z, Z)-, phytol and n-hexadecanoic acid. Chromatogram of GC-MS analysis of acetone extract of *Murraya koenigii* leaves shows 36 peaks for 33 compounds. The major compounds as depicted by high peak area percentage are caryophyllene, koenimbin, mahanimbine and phytol. Similarly, chromatogram of GC-MS analysis of methanol extract of *Murraya koenigii* leaves shows 38 peaks for 37 compounds. The major compounds as depicted by high peak area percentage are koenimbin, mahanimbine, phytol and caryophyllene. Chromatogram of GC-MS analysis of acetone extract of *Bauhinia variegata* flower buds shows 44 peaks for 39 compounds. The major compounds as depicted by high peak area percentage are β-bisabolene, cyclohexene, 4-[(1E)-1, 5-dimethyl-1, 4-hexadien-1-yl]-1-methyl- and heptacosane. Similarly, chromatogram of GC-MS analysis of methanol extract of *Bauhinia variegata* flower buds shows 34 peaks for 33 compounds. The major compounds as depicted by high peak area percentage are 4H-pyran-4-one, 2, 3-dihydro-3, 5-dihydroxy-6-methyl, β-bisabolene, n-hexadecanoic acid, 4-[(1E)-1, 5-dimethyl-1, 4-hexadienyl]-1-methyl-1-cyclohexene and 5-hydroxymethylfurfural. GC-MS analysis for screening of major compounds present in the medicinal edibles is shown below :

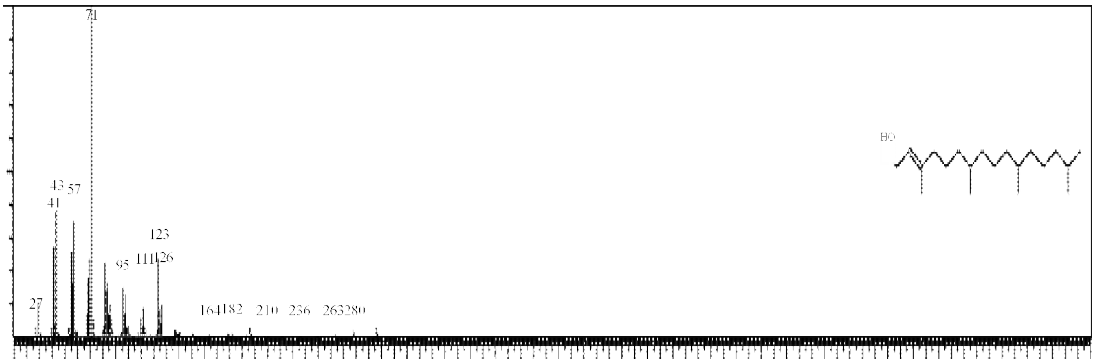
Major Compounds Reported in Acetone and Methanolic Extract of *Urtica dioica* (Leaves)

1. Formula:C18H30O2 CAS:463-40-1 MolWeight:278 RetIndex:2191

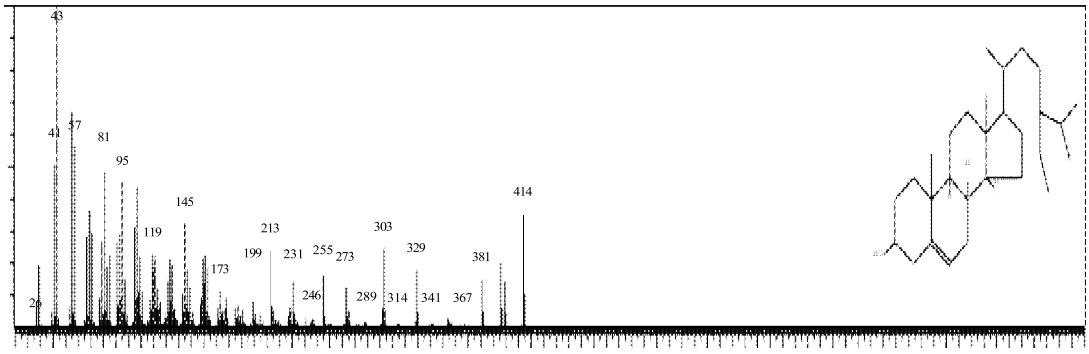
Compound Name: 9,12,15-Octadecatrienoic acid, (Z,Z,Z)-



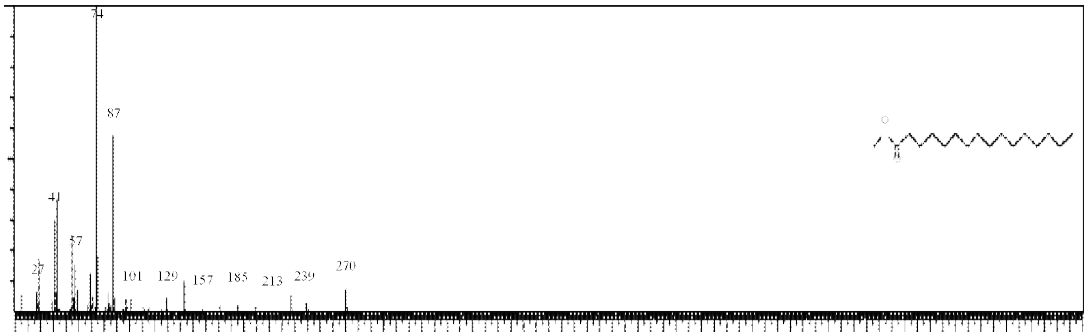
2. Formula: C20H40O CAS:150-86-7 MolWeight:296 RetIndex:2045
Compound Name: Phytol



3. Formula:C29H50O CAS:83-47-6 MolWeight:414 RetIndex:2731
Compound Name:. Stigmast-5-en-3-ol

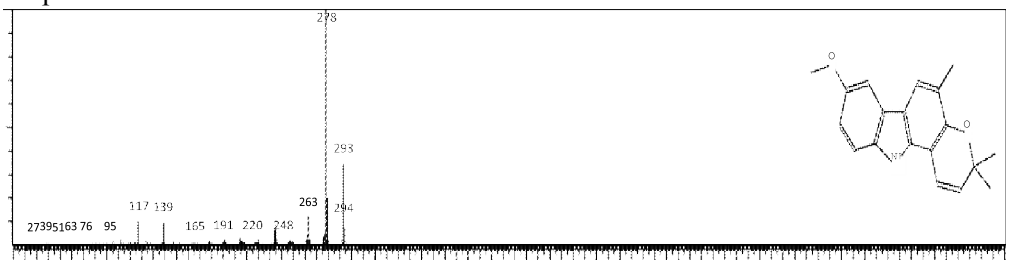


4. Formula:C17H34O2 CAS:112-39-0 MolWeight:270 RetIndex:1878
Compound Name: Hexadecanoic acid **(in Methanolic Extract only)**

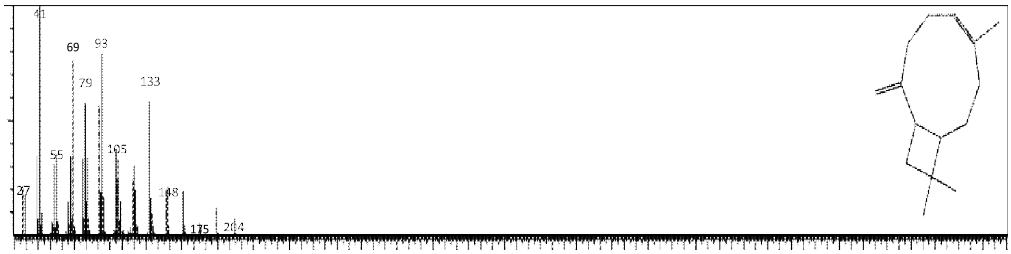


Major Compounds Reported in Acetone and Methanolic Extract of *Murraya koenigii* (Aerial parts)

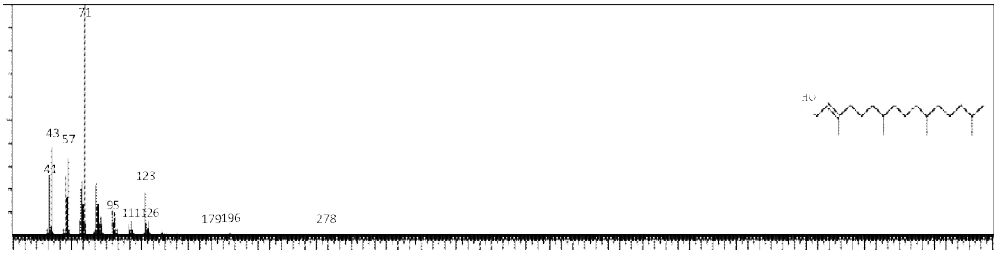
1. Formula:C19H19NO2 CAS:21087-98-9 MolWeight:293 RetIndex:2410
Compound Name: Koenimbin



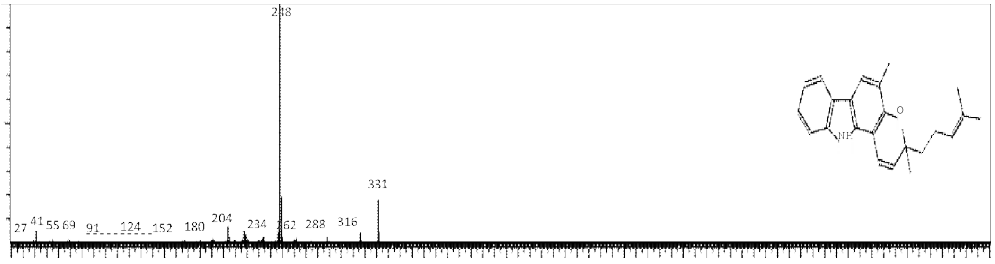
2. Formula:C15H24 CAS:87-44-5 MolWeight:204 RetIndex:1494
Compound Name: Caryophyllene



3. Formula:C20H40O CAS:150-86-7 MolWeight:296 RetIndex:2045
Compound Name: Phytol

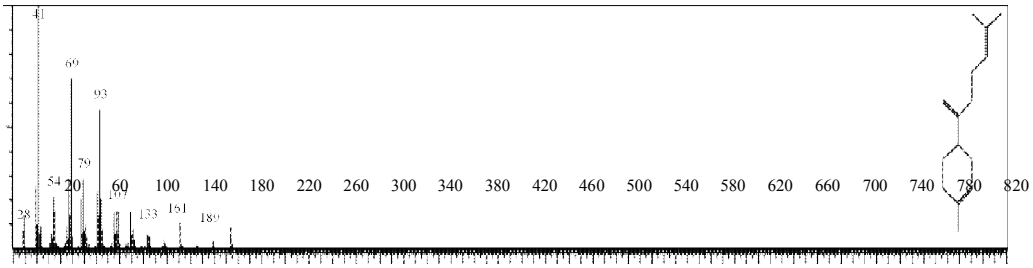


4. Formula:C23H25NO CAS:21104-28-9 MolWeight:331 RetIndex:2703
Compound Name: Mahanimbine

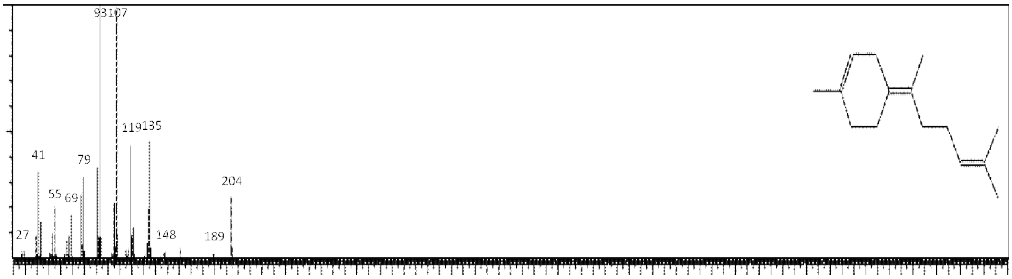


***Major Compounds Reported in Acetone and Methanolic Extract of *Bauhinia variegata* (Flower Buds) (4,5,6 in Methanolic Extract Only)**

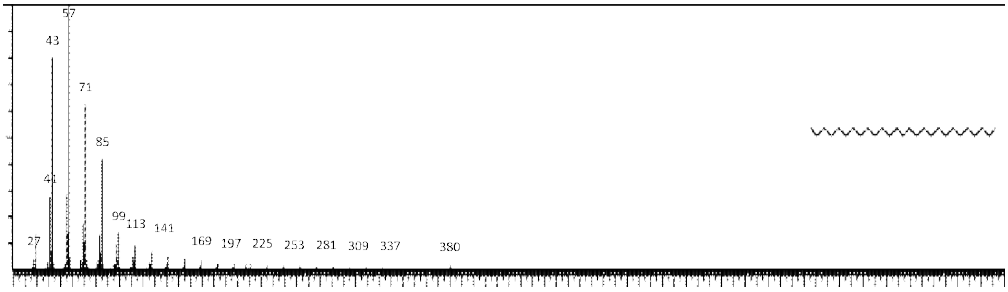
1. Formula:C15H24 CAS:495-61-4 MolWeight:204 RetIndex:1500
Compound Name: beta.-Bisabolene



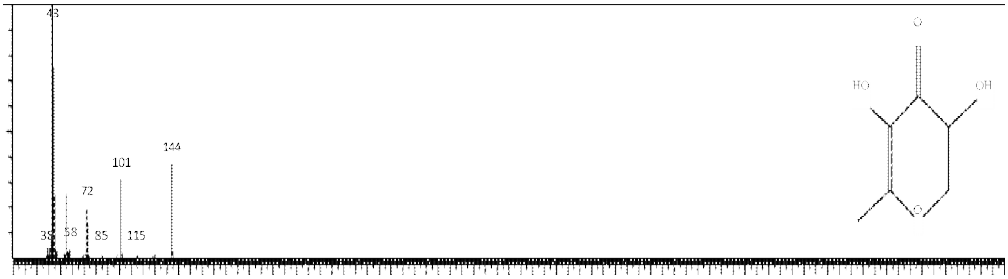
2. Formula:C15H24 CAS:53585-13-0 MolWeight:204 RetIndex:1534
Compound Name: Cyclohexene, 4-(1,5-dimethyl-4-hexen-1-ylidene)-1-methyl-, (E)-



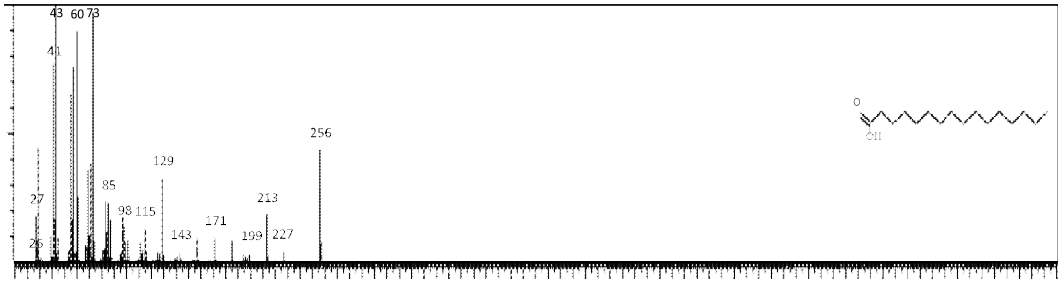
3. Formula:C27H56 CAS:593-49-7 MolWeight:380,RetIndex:2700
Compound Name: Heptacosane



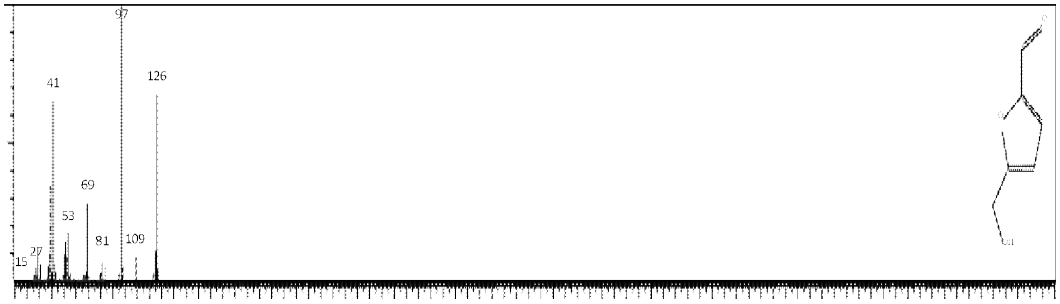
4. Formula: C6H8O4 CAS:28564-83-2 MolWeight:144 RetIndex:1269
Compound Name: 4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl-



5. Formula: C16H32O2 CAS:57-10-3 MolWeight:256 RetIndex:1968
Compound Name: n-Hexadecanoic acid



6. Formula:C6H6O3 CAS:67-47-0 MolWeight:126 RetIndex:1163
Compound Name:5-Hydroxymethylfurfural



The phytochemical analysis of medicinal edibles conducted through Gas Chromatography-Mass Spectrometry (GC-MS) has provided valuable insights into their chemical composition and potential health benefits. The study successfully identified a diverse array of bioactive compounds including Caryophyllene, Phytol, Stigmast-5-en-3-ol, n-Hexadecanoic acid, 5-Hydroxymethylfurfural etc. which are known for their different pharmacological properties. The presence of these phytochemicals underscores the significance of these plant species in traditional medicine and also highlight their relevance in modern healthcare practices. However, further research is essential to explore the full range of benefits these compounds offer, positioning medicinal edibles as important contributors to holistic health and nutrition.

The authors are thankful to Himalayan Forest Research Institute (HFRI), Shimla, Himachal Pradesh for identification of collected plant species and Central Instrumentation Lab (CIL), Bathinda for GC-MS analysis of plants.

References :

1. Anonymous (2009). Mosby's Medical Dictionary, 8th edition, Elsevier.
2. Cragg, G.M. and D. J. Newman (2013). *Biochimica et Biophysica Acta, 1830:* 3670-3695.
3. Duraipandiyan, V., M. Ayyanar and S. Ignacimuthu (2006). *BMC Complementary and Alternative Medicine, 6:* 35-

41.
4. Fabricant, D.S. and N.R. Farnsworth (2001). *Environmental Health Perspectives, 109:* 69-75.
5. Hubschmann, H.J. (2015). Handbook of GC-MS: Fundamentals and Applications. John Wiley & Sons, New York.
6. Kala, C.P., P.P. Dhyani and B.S. Sajwan (2006). *Journal of Ethnobiology and Ethnomedicine, 2:* 1-15.
7. Rao, R.R. (1996). *Journal of Ethnobotany, 8:* 14-24.
8. Sharma, N., V. Kumar, M. P. Chopra, A. Sourirajan, K. Dev and M. El-Shazly (2020). *Journal of Ethnopharmacology, 255:* 1-7.
9. Singh, H.B. (2000). Alternative source for some conventional drug pPlants of India. In: Maheshwari, J.K. (eds.) Ethnobotany and medicinal plants of Indian Subcontinent, Scientific Publishers, Jodhpur, India.
10. Yadav, R.N.S. and M. Agarwala (2011). *Journal of Phytology, 3*(12): 10-14.