**Advances in Bioresearch**
Adv. Biores., Vol 13 (3) May 2022: 14-17
©2022 Society of Education, India
Print ISSN 0976-4585; Online ISSN 2277-1573
Journal's URL:http://www.soeagra.com/abr.html
CODEN: ABRDC3
DOI: 10.15515/abr.0976-4585.13.3.1417

Advances in Bioresearch

## ORIGINAL ARTICLE

# GC-MC Analysis of *Foeniculum vulgare*

***Ashish Mishra and Mohsin Hasan Khan**
Department of Chemistry
Gandhi Faiz-e-Aam College, Shahjahanpur, U.P.
(M.J.P.R. University, Bareilly, U.P.)
*Corresponding author: chemistryn45@gmail.com

**ABSTRACT**
*Foeniculum vulgare is being used in several Ayurvedic preparations as medicine. The extraction from Foeniculum vulgare was carried out by using benzene solvent and obtained greenish yellow colour extract. The extract was analysed by the GC-MS method for tentative identification, the GC-MS examination of that potential extract revealed the presence of various compounds including Nonacosan-10-one as having maximum percent area (32.29). Another complex Anethole also identified in the GC-MS analysis is also essential oil component and well known anti-bacterial compound.*
***KEYWORDS:*** *Anethole, GC-MS, Foeniculum vulgare, Nonacosan-10-one, Phytochemicals*

Received 04.03.2022 Revised 22.04.2022 Accepted 19.05.2022

**How to cite this article:**
A Mishra and M H Khan. GC-MC Analysis of *Foeniculum vulgare*. Adv. Biores. Vol 13 [3] May 2022. 14-17

## INTRODUCTION

*Foeniculum vulgare*re balance the digestive tract, and promotes a healthy bowel movement and used as remedy for diarrhea. Fennel helps in remedial endocrine, digestive, reproductive and respiratory systems related problems. Fennel shows antinociceptive, anti-pyretic, antiviral, anti-spasmodic, anti-thrombotic, antimicrobial, anti-inflammatory, apoptotic, anti-mutagenic, cardiovascular, chemomodulatory, anti-tumor, hepatoprotective, memory enhancing, hypolipidemic and hypoglycemic properties [1]. Several phytochemicals such as neochlorogenic acid-1.40%, ferulic acid-7-o-glucoside-5.223%, hesperidin - 0.2035%, caffeic acid-2.960%, chlorogenic acid-2.98%, p-coumaric acid -4.325%, ferulic acid-3.555%, quercetin-7-o-glucoside-3.219%, gallic acid -0.169% and chlorogenic acid -6.873% were also reported [2].Saharkhiz and Tarakemeh (2013) reported that the major oily compounds at various fruit adulthood stages - limonene (3.0 to 3.3 %), trans-anethol (84.1 to 86.1 %), fenechone (7.13 to 8.86 %), and methyl chavicol (2.5 to 2.7 %) [3]. The GC-MS analysis of fennel showed α-pinene, α-fenchone, D-limonene, T-anethol, and fenchol were the maximum in its essential oil. Saxena et al., 2018 reported that essential oil obtained from fennel includes 4-allyl anisole/γpinene, terpinene, myrcene, cymene, gerniol, methyl chavicol, geranyl acetate and anethole estragol. [4] The seeds of fennel contain about 2% essential oil with 4-allyl-anisole (53.69%) and anethole (44.30%) [5]. The present studied was perfprmed to know chemical compounds present in extract of *Foeniculum vulgare.*

## MATERIAL AND METHODS

Gas chromatography–mass spectrometry is a well recognized analytical technique which combines the features of both the gas-chromatography and mass spectrometry. It is used to recognize diverse compounds present within a test sample. In this technique compound is first ionized and identified on the basis of their mass and charge ration (m/z). The GC-MS analysis of all the test samples was carried out in Advanced Instrumentation Research Facility (AIRF) of Jawaharlal Nehru University (JNU), New Delhi. Extracts were dissolved at the concentration of 1 mg/ml concentration in their respective solvent. 1 µl of all dissolved extracts were burdened into a RTX-5 column of automated GC-MS machine of model GC-MS-QP-2010 plus, Shimadzu Make. As a carrier gas Helium was used at a constant column with flow of 1.2 ml/min. The temperature of GC-MS was used to in the range of 100-200°C. The mass spectra of the tested

samples were recorded from 40 to 950 Dalton in different fragments and the fragment scan was taken at 70 eV at an interval of 0.5 s. Finally, the compound in the test samples was verified by data comparing the peak mass spectrum with the mass spectral database of the Wiley and National Institute of Standard and Technology (NIST) libraries.

## RESULTS AND DISCUSSION

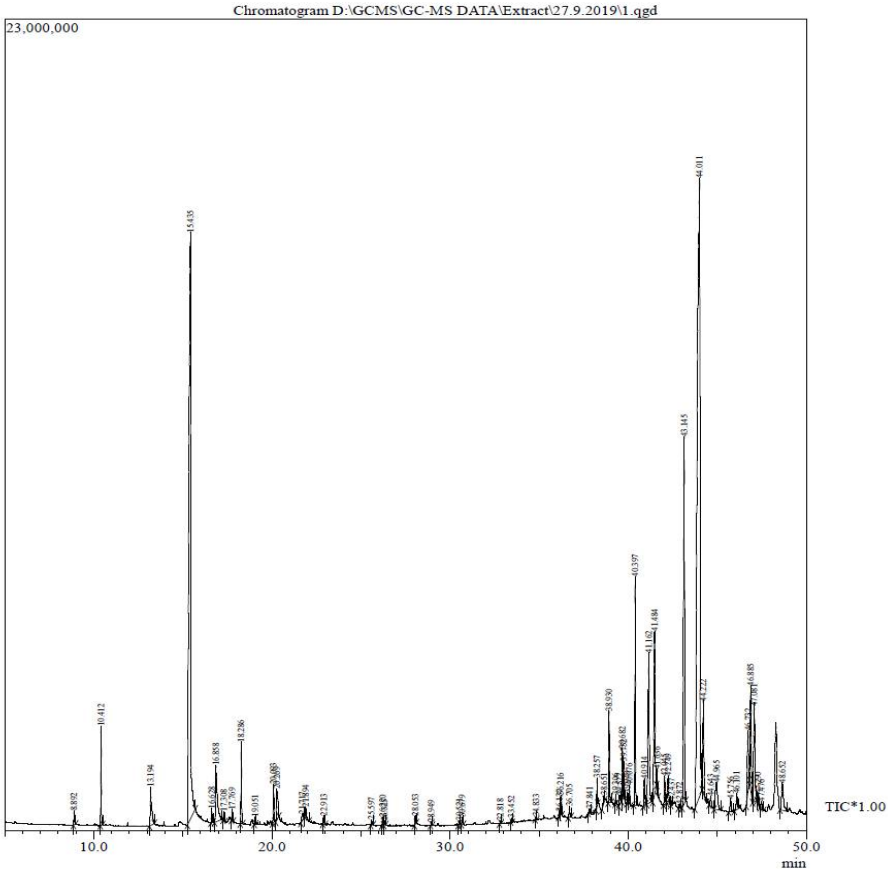
The GC-MS research tentatively described different compounds with unique retention time ( RT), percent area and peak location that resembled the typical compound library of NIST or WILEY. Table- 1 showing the major compounds found by GC-MS testing of the benzene extract of *Foeniculum vulgare*. Fig.1 also display the peaks and retention time of the recognized compounds by GC-MS. The GC-MS analysis of benzene extract identified various groups of compounds such as alcohols, alkanes, fatty acid esters, vitamins, aldehydes and acids etc., which were already known for various bio-active roles. Nonacosan-10-one of all the known compounds was recorded to have a maximum percent area (32.29 percent) of 44.011 at retention time (Fig. 1 & Table 1). In the NIST compound library, this compound showed a 93 Similarity Index (SI). This compound's observed chemical formula is $C_{29}H_{58}O$. The second higher compound in this extract was recognised as Anethole, which had a peak retention time of 15.435 and occupied an area of 22.09 percent (Table 1). Some other components were also identified in the GC-MS analysis that showed relatively significant presence with a suitable percent area, such compounds with an ascending percent area order are as follows:- Estragole (1.07 percent area at 13.194 RT), Fenchone (1.09 percent area at 10.412 RT), Gamma.-Sitosterol (1.14 percent area at 48.652 RT), Pentatriacontane (1.15 percent area at 10.412 RT), Lignocerol (2.05 percent area at 44.222 RT), Eugenol (2.06 percent area at 38.930 RT), 3.6-Nonadecadione (2.41 percent area at 46.885 RT), Eicosanal (2.77 percent area at 47.081 RT), Henicosanal (7.70 percent area at 43.145 RT), Piperine (4.04 percent area at 41.484 RT) and 1-Heptacosanol (4.19 percent area at 41.162 RT), and some small peaks were also shown in the GC-MS analysis graph. However, the GC-MS examination of that potential extract revealed the presence of various compounds including Nonacosan-10-one as having maximum percent area (32.29). Nonacosan-10-one is well known essential oil component which have potential antibacterial as well as alternative medicine constituent [6]. Another complex Anethole also identified in the GC-MS analysis is also 3essential oil component and well known anti-bacterial compound [7]. In the light of previous investigations, it was found that all the identified compound of the benzene extract of *Foeniculum vulgare* have inhibitory properties against not only bacteria but also against fungi and protozoan's also [8, 9].

**Table 1:- List of Major compounds indentified by GC-MS of Foeniculum vulgare**

| Peak | R.Time | (Similarity Index) SI | Area% | Name | Formula |
|---|---|---|---|---|---|
| 1. | 10.412 | 98 | 1.09 | Fenchone | $C_{10}H_{16}O$ |
| 2. | 13.194 | 97 | 1.07 | Estragole | $C_{10}H_{12}O$ |
| 3. | 15.435 | 98 | 22.09 | Anethole | $C_{10}H_{12}O$ |
| 4. | 16.858 | 97 | 2.06 | Eugenol | $C_{10}H_{12}O_2$ |
| 5. | 38.930 | 96 | 1.15 | Pentatriacontane | $C_{35}H_{72}$ |
| 6. | 40.397 | 94 | 3.04 | Docosanal | $C_{22}H_{44}O$ |
| 7. | 41.162 | 96 | 4.19 | 1-Heptacosanol | $C_{27}H_{56}O$ |
| 8. | 41.484 | 93 | 4.04 | Piperine | $C_{17}H_{19}NO_3$ |
| 9. | 43.145 | 94 | 7.70 | Henicosanal | $C_{21}H_{42}O$ |
| 10. | 44.011 | 93 | 32.29 | Nonacosan-10-one | $C_{29}H_{58}O$ |
| 11. | 44.222 | 95 | 2.05 | Lignocerol | $C_{24}H_{50}O$ |
| 12. | 44.965 | 90 | 1.17 | Piperolein B | $C_{21}H_{29}NO_3$ |
| 13. | 46.732 | 78 | 1.48 | Nonacosan-14-one | $C_{29}H_{58}O$ |
| 14. | 46.885 | 83 | 2.41 | 3,6-Nonadecadione | $C_{19}H_{36}O_2$ |
| 15. | 47.081 | 92 | 2.77 | Eicosanal | $C_{20}H_{40}O$ |
| 16. | 48.652 | 86 | 1.14 | Gamma.-Sitosterol | $C_{29}H_{50}O$ |

**Figure 1:- Tentative Identification By GC-MS of Sample Foeniculum vulgare**




The peaks of GC-MS examination recognized on the basis of their retention time and molecular weight by analyzing similarity with NIST/WILEY libraries.

## CONCLUSION

The overall study of all the sample extract exposed that they have potential antibacterial activity. However, the GC-MS assessment identified various phytocompound compositions in the extracts. It is demonstrated from the GC-MS and anti-bacterial studies that all the properties of extract is due to the synergistic effect of all compounds.

## ACKNOWLEDGEMENTS

We are thankful to Advanced Instrumentation Research Facility (AIRF) of Jawaharlal Nehru University (JNU) for GC-MS analysis.

**CONFLICT OF INTEREST***:* None declared

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