

Capsicum frutescence (Red Chili) GC- MS Analysis of n-Hexane Extract of Fruit

Riddhi Maheshwari¹, Dr.Darshana Mehta², Anamika Jain³, B.K. Mehta⁴

¹Ph.D Research Scholar, Department of Chemistry, Govt. Holkar Science College Indore – 452010 (M.P.)

²Lecturer, School of Studies Chemistry & Biochemistry, Vikram University Ujjain -456010 (M.P.)

³Head, Department of Chemistry, Govt. Holkar Science College Indore – 452010 (M.P.)

⁴Head, School of Studies Chemistry & Biochemistry, Vikram University Ujjain -456010 (M.P.)

Abstract: *Capsicum frutescence* is present in the liberal quantities in the placental tissue (which holds the seeds). The seeds themselves do not produce any capsicum, although the highest concentration of capsaicin can be found in the white pith around the seeds. For the present work we have taken the fruit of chili peppers belonging to the family Solanaceae and genus capsicum shows an incredible diversity and is consumed by a large section of population throughout the world because of its health beneficial effects. Chemical compounds such as capsaicinoids, carotenoids (provi-tamin A), flavonoids, vitamins (Vitamins C and E), minerals, essential oils and aroma of the fruits have shown to possess anticancer, anti-inflammatory, antimicrobial and antioxidant properties. Gas chromatography mass spectrometry (GC-MS) analysis revealed the presence of total number of 7 compounds from the hexane fraction of *C. frutescence*. GC-MS showed the presence of many biologically important volatile constituents including heterocyclic compounds, hydrocarbons, long chain aliphatic carboxylic acids and their derivatives. The compounds were identified by comparing their retention time with that of literature and by interpretation of mass spectra. The quantitative estimation of each peak was made by estimating area of the peak by computer attached to GC-MS instrument.

Keywords: *Capsicum frutescens*, hexane extract and Gas chromatography mass spectrometry (GC-MS).

Introduction

Natural products are chemical compounds or substances isolated from living organism. The chemistry of the natural product include their biosynthesis, extraction, identification, quantification, structural elucidation, physical and chemical properties and reactions They are produced by the pathway of primary or secondary metabolism. "A chemical substance produced by a living organism; a term used commonly in reference to chemical substances found in nature that have distinctive pharmacological effects." Capsicum is a member of the solanaceae family that includes tomato, potato, tobacco, petunia. The genus Capsicum consists of approximately 22 wild species (*Capsicum frutescence*, *Capsicum annum*, *Capsicum baccatum*, *Capsicum Chinense*, *Capsicum pubescens*) and five domesticated species. Cayenne or Capsicum derives its name from the Greek, "to bite", in allusion to the hot pungents properties of the fruits and seeds. Cayenne pepper was introduced into Britain from India in 1548. Capsicum is a genus of flowering plant from family solanaceae and is widely cultivated in south-east Asian and Latin-American countries. Capsicum fruit was one of the plants that have a rich source of antioxidants compound¹.

Review of literature

In the broadest sense, natural products include any substance produced by life². Natural products sometimes have pharmacological or biological activity that can be of therapeutic benefit in treating diseases. As such, natural products are the active components not only of most traditional medicines but also many modern medicines³.

Scientific classification

Scientific name : Capsicum frutescences

Kingdom : Plantae

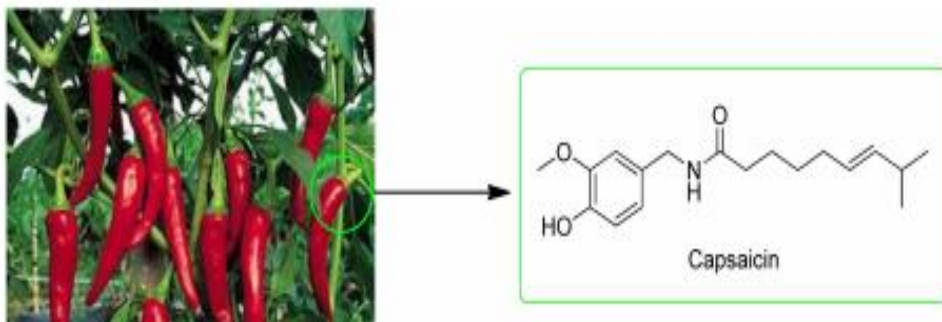
Order : Solonales

Family : Solanaceae

Genus : Capsicum

Species : C. frutescence

The fruit of most species of capsicum contains "Capsaicin" (8-methyl-N-vanillyl-6- nonenamide), a lipophilic chemical that can produce a strong burning sensation (spiciness) in the mouth of the unaccustomed eater⁴. Capsaicinoids, nonvolatile alkaloids, are acid amides of C9-C11 branched-chain fatty acids and vanillylamine, and are responsible for the pungency of the *Capsicum* specie⁵.



Red chili has been used as an alternative medicine for the treatment of inflammation, diabetes, low back pain and acute tonsillitis. Moreover, capsicum plaster containing powdered capsicum and capsicum tincture has been used in Korean hand acupuncture to reduce postoperative nausea, vomiting and sore throat. Chili was an important plant in traditional Mayan medicine to treat various ailments, such as sore throat, earache and skin care⁶. Capsaicin is currently used for the treatment of diabetic neuropathy, osteoarthritis, post-herpetic neuralgia and psoriasis⁷.

Experimental Work

GC-MS analysis of *C. frutescence* n- hexane extracts,

1. Material and method

For the present study we have chosen the capsicum frutescence fruits. The plant materials were collected from Jhabua, M.P. the capsicum fruit. The samples were dried under shade at room temperature. The seeds were separated from dried pods by crumbling and then screening. The dried chili peppers were blended using a blender and stored in a clean glassware container until needed for analysis.

2. Preparation of extract

Chili pepper powders (2kg) were extracted with hexane and benzene. Powder of *C. frutescence* is taken in round bottom flask and deep in 3 liter hexane for 15 days then use distillation method to prepare extract of *C. frutescence* in hexane. The distillation process is continuing for some days. The solvent was recovered under vacuum to afford thick liquid. It was again fractionated by different solvents in increasing order of polarity viz. hexane, benzene, ethyl acetate and chloroform. The hexane extract was again analyzed by TLC technique using different solvent systems.

The GC-MS analysis of sample was performed by CIL/SAIF Panjab University, Chandigarh. The analysis revealed the presence of 10 compounds with broad band. It is decided to GC-MS analysis.

Gas chromatography / Mass spectrometry (GC-MS)

In gas chromatography, a sample is vaporized in a heated injector block and deposited on to the head of a chromatographic column that contain a non – volatile liquid stationary phase. The components of a mixture are separated on the basis of their varying affinity or, and solubility in the stationary phase. Elution of the separated components is affected by the flow of an inert carrier gas. It is usual practice to perform GC separation at elevated temperature (150 c to 300 “c) to bring many not so volatile, but thermally stable compounds under its domain.

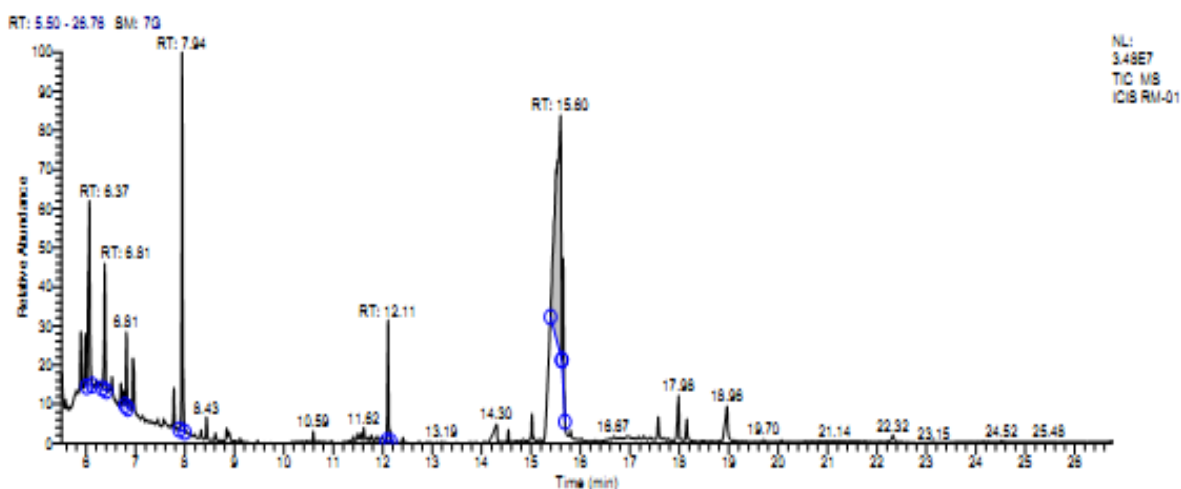


Fig: - Instrument of Gas Chromatography/Mass spectrometry (GC-MS)

CIL/ SAIF Panjab University Chandigarh

Sample Header

Data File:	RM-01
Original Data Path:	C:\GCMS-data\YEAR 2017\MAY\24
Sample Type:	Unknown
Sample ID:	RM-01
Sample Name:	
Acquisition Date:	05/24/17 04:57:48 PM
Run Time(min):	21.26
Injection Volume(μl):	10.00
Scans:	6252
Low Mass(m/z):	50
High Mass(m/z):	700
Instrument Method:	C:\GCMS-data\instrument method\GERNAL-gcms-METHOD.meth



Qual Peak Table

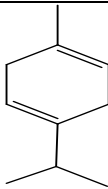
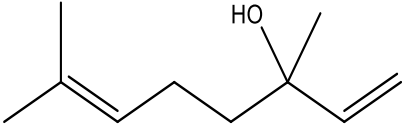
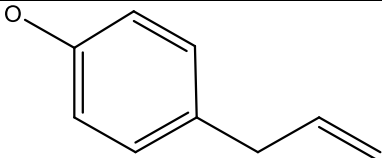
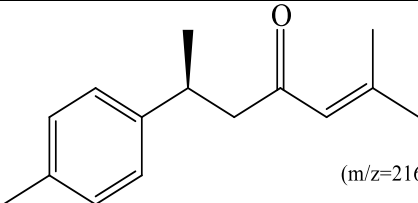

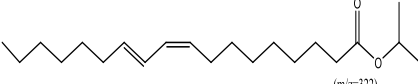
RT	Peak Area	Area %	Peak Height
6.06	38954427.34	12.30	16494971.72
6.37	18141026.88	5.73	11267295.07
6.81	9436372.72	2.98	6660015.84
7.94	51837430.35	16.36	33738459.70
12.11	17704673.26	5.59	10829092.85
15.60	164111863.28	51.80	21365510.86
15.65	16621248.21	5.25	11545858.49

RESULTS AND DISCUSSION:

GC-MS analysis revealed the presence of 7 compounds from the hexane fraction of *C. frutescences*. The compounds were identified by comparing their retention time with that of literature and by interpretation of mass spectra. The quantitative estimation of each peak was made by estimating area of the peak by computer attached GC-MS instrument. The results of GC-MS are given in table:

Table: Retention time, peak area and peak% of isolated compounds

Peak no.	Retention time	Peak area	Peak %	Name of compounds	Structure of Compound
1	6.06	38954427.34	12.30	3-hexane-1-ol, 2,5-dimethylFormate(z)	

2	6.37	18141026.88	5.73	c- terpinene	 (m/z =136)
3	6.81	9436372.72	2.98	1,6-octadien-3ol,3,7-dimethyl	 (m/z =154)
4	7.94	51837430.35	16.36	Estragole	 (m/z = 148)
5	12.11	17704673.26	5.59	Ar- tumerone	 (m/z=216)
6	15.60	164111863.28	51.80	9,12-octadecadienoic acid	 (m/z = 280)
7	15.65	16621248.21	5.25	Isopropyl 9-cis,11-trans octadecadienoate	 (m/z=322)

Conclusion

Keeping in view the medicinal properties of *Capsicum Frutescence*, an attempt has been made in this experimental work to explore various dimensions of the drug including phytochemical and pharmacological studies carried out on this drug. GC-MS are useful; tools for chemical analysis, especially when used together. Finally, no analytical technique produces results that are completely without doubt. An effective advocate should always seek conformation of GC-MS results.

Acknowledgments

I would like to express my special thanks to professor Dr.B.K.Mehta, Dr.Anamika jain and Miss. Darshana Mehta has given her valuable support, cooperation and suggestion from time to time in successfully complete my research work.

References

- [1] Rosengarten F. (1969), the book of spices, Jove Publ., Inc., New York.
- [2] Samuelson G. (1999), Drugs of natural origin: A text book of pharmacognosy. Taylor & Francis Ltd.
- [3] Brahmachari G. (2010), Handbook of pharmaceutical natural products, Wiley - VCH
- [4] Mason J.R., Bean N.J., Shah P.S. and Clark L., (2011), Journal of chemical ecology.
- [5] Diaz J., Pomar F., Bernal A., Merino F., (2004). Peroxidases and the metabolism of capsaicin in *Capsicum annum* L. *Phytochemistry Reviews*, 3, 141–157.
- [6] Mehta B.K., Mehta D., Gurnani N. and Gupta M. (2015), Chemical composition, total phenolic and flavonoid contents, and in vitro antimicrobial and antioxidant activities of crude extracts from red chilli seeds (*Capsicum frutescence* L.), *Journal of Taibah University for Science, India*.
- [7] Jin R., Pan J., Xie H., Zhou B., Xia X., 2009. Separation and Quantitative Analysis of Capsaicinoids Chili Peppers by Reversed-Phase Argention LC. *Chromatographia*, 70 (5–6), 1011.