

Gas Chromatography-Mass Spectrometry Analysis of Ethanolic Fruit Extract of *Momordica charantia* var. *Muricata*

D. Mouttoulatchoumy and S. Alamelumangai*

Research Department of Home Science, Bharathidasan Government College for Women, Thiruvalluvar Nagar – 605001, Puducherry, India; mangaiguru2yahoo.co.in

Abstract

The fruits of *Momordica charantia* (bitter gourd) have been used as folklore medicine for the management of ailments such as leprosy, menstrual problems, hypertension and most efficiently for diabetes. The present investigation was carried to identify active components in small round variety of immature fruit *M. charantia muricata* was analysed. The fruits were procured directly from the garden at Bhuvanagiri, Tamil Nadu, were washed in tap water and cut into small pieces and were shade dried for 10 days. The dried fruits were ground into fine powder. The sample was extract with ethanol and analyzed through Gas Chromatography-Mass spectrometry for identification of different compounds. Analysis revealed presence of 25 phyto components. The major compound present in the ethanolic fruit extract was identified as β -Sitosterol with RT 37.26 and 12.16% relative peak area. This compound has antihyperlipoproteinaemic, antibacterial and antimicrobial activity, and helps tumor inhibition in vivo.

Keywords: GC-MS Analysis, *Momordica charantia* var. *muricata*, Phyto Components

1. Introduction

"*Momordica charantia* L. commonly known as bitter gourd is an economically important medicinal plant belonging to the family cucurbitaceae. Two varieties of this plant are cultivated in India. *M. charantia* var. *charantia* with large fruits are fusiform in shape and *M. charantia* var. *muricata*, are identified by small, round fruit"¹. The small round variety of fruits are 2-3 cm long and 1 cm diameter. "All parts of plant, especially roots, leaves, fruits and seeds are widely used as traditional medicine throughout Asia, East Africa and South America. The leaves and fruits are used for external application in lumbago, ulceration and bone fracture and internally in leprosy, haemorrhoids and Jaundice"². "Fruits and seeds of bitter gourd possess medicinal properties such as

anti-HIV, anti-ulcer, anti-inflammatory, anti-leukemic, anti-microbial, anti-tumor and antidiabetic property"³.

"The immature fruits are eaten as vegetables and are good sources of vitamin C, vitamin A and phosphorus and iron"⁴. Review of literature did not reveal much evidence on the phyto components available in small variety of bitter gourd; hence the present research was done to find out the active constituents present in the fruit extract.

2. Materials and Methods

2.1 Plant Material

The availability of bitter gourd was identified in plenty from the gardens in the Bhuvanagiri village, Cuddalore district, Tamil Nadu and the variety of small bitter gourd was authenticated by the Department of Pharmacognosy,

*Author for correspondence

Mother Theresa Institute of Health Science and Research Institute, Puducherry.

2.2 Preparation of Plant Material

Fresh unripe fruit of *Momordica charantia* var. *muricata* was procured from the garden and was washed in running water to remove dust and any other foreign materials, sliced into round and very thin pieces and was dried in shade until the unripe fruit pieces were void of

moisture and brittle. The dried pieces were ground into a powder with domestic electric grinder.

2.3 Gas Chromatography and Mass Spectrometry Analysis

Twenty five gram of sample was soaked overnight in 60ml ethanol. After filtration 1ml of filtrate was evaporated to 2µl. The components were analyzed using Bruker 436GC column and BR-5MS with a heating rate of

Table 1. Phyto compounds identified in the small round bitter gourd powder

No.	RT	Name of the compound	Molecular Formulae	Molecular Weight	Peak Area %
1	4.69	4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl-	C ₆ H ₈ O ₄	144	0.4
2	7.89	Eugenol	C ₁₀ H ₁₂ O ₂	164	2.52
3	11.03	6-Epishyobunone	C ₁₅ H ₂₄ O	220	0.12
4	13.48	5,5,8a-Trimethyl-3,5,6,7,8,8a-hexahydro-2H-chromene	C ₁₂ H ₂₀ O	180	0.71
5	15.07	Hexadecanoic acid, methyl ester	C ₁₇ H ₃₄ O ₂	270	0.63
6	15.99	Hexadecanoic acid, ethyl ester	C ₁₈ H ₃₆ O ₂	284	2.24
7	17.39	9,12-Octadecadienoic acid (Z,Z)-	C ₁₈ H ₃₂ O ₂	280	0.46
8	17.64	Phytol	C ₂₀ H ₄₀ O	296	0.72
9	18.34	Linoleic acid ethyl ester	C ₂₀ H ₃₆ O ₂	308	0.61
10	18.83	Octadecanoic acid, ethyl ester	C ₂₀ H ₄₀ O ₂	312	4.52
11	20.53	9,12,15-Octadecatrienoic acid, ethyl ester, (Z,Z,Z)-	C ₂₀ H ₃₄ O ₂	306	1.94
12	21.13	Eicosanoic acid	C ₂₀ H ₄₀ O ₂	312	1.14
13	22.88	5,8,11,14-Eicosatetraenoic acid, methyl ester, (all-Z)-	C ₂₁ H ₃₄ O ₂	318	5.88
14	23.53	Glycidol stearate	C ₂₁ H ₄₀ O ₃	340	0.05
15	25.05	Butyl 9,12,15-octadecatrienoate	C ₂₂ H ₃₈ O ₂	334	16.36
16	25.71	5,8,11,14-Eicosatetraenoic acid, ethyl ester, (all-Z)-	C ₂₂ H ₃₆ O ₂	332	5.8
17	26.49	Octadecanoic acid, 2-hydroxy-1-(hydroxymethyl)ethyl ester	C ₂₁ H ₄₂ O ₄	358	9.14
18	27.73	Squalene	C ₃₀ H ₅₀	410	4.89
19	28.11	9,12,15-Octadecatrienoic acid, 2,3-bis[(trimethylsilyl)oxy]propyl ester, (Z,Z,Z)-	C ₂₇ H ₅₂ O ₄ Si ₂	496	2.95
20	31.3	γ-Tocopherol	C ₂₈ H ₄₈ O ₂	416	3.15
21	32.81	Vitamin E	C ₂₉ H ₅₀ O ₂	430	5.69
22	36.77	Stigmasterol	C ₂₉ H ₄₈ O	412	7.65
23	37.26	β-Sitosterol	C ₂₉ H ₅₀ O	414	12.16
24	38.47	Stigmasta-5,24(28)-dien-3-ol, (3β)-	C ₂₉ H ₄₈ O	412	8.67
25	38.96	Ergost-7-en-3-ol, (3β)-	C ₂₈ H ₄₈ O	400	1.6

RT – Retention Time

10° C/minute, sample injection was performed in the split ratio 10:1 and the carrier gas flow was maintained at 1 ml/minute during the run.

3. Results and Discussion

The analysis of the ethanolic extract of bitter gourd powder of *M. charantia* indicates 25 different compounds at different Retention Time (RT) and different percentage peak area are listed in Table 1. Interpretation of GC-MS was conducted using the database of NIST Version 11. The comparison of the mass spectrums with the data base gave more than 90% match as well as confirmatory compound of the structure match. The peak compounds were compared with the known phyto-constituents and the molecular weight, structure and formula were ascertained by using the NIST, Pub Chem, Chem Spider and Chemical book.

The Table 1 shows the different compounds identified

in the ethanolic extract of bitter gourd powder with different retention time and peak area.

The major compound present in *M. charantia* was β -Sitosterol with RT 37.26 and 12.16 % relative peak area. The structure of β -Sitosterol is given in Figure 1, the molecular formula is $C_{29}H_{50}O$, the molar weight is 414 and it has antihyperlipoproteinaemic, antibacterial, antimicrobial activity and is a inhibitor of tumor promotion.

3.1 Therapeutic Properties of Phyto Compounds

The therapeutic properties of phytochemicals present in the ethanolic extract of small round bitter gourd powder of *Momordica charantia* var. *muricata* are shown in the Table 2.

1. Antifungal 2. Antimicrobial 3. Antioxidant 4. Anti-inflammatory 5. Cardiovascular properties 6. Hypocholesterolemic 7. Nematicide 8. Pesticide. 9. Diuretic

Table 2. Phyto compounds and functional properties in unripe fruit powder of *M. charantia*

Compounds	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	
4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl-	+	+																												
Eugenol			+	+	+																									
Hexadecanoic acid, methyl ester			+	+		+																								
Hexadecanoic acid, ethyl ester		+	+				+	+																						
Phytol		+	+	+					+																					
9,12,15-Octadecatrienoic acid, ethyl ester, (Z,Z,Z)-				+		+	+			+	+	+	+	+																
Octadecanoic acid, ethyl ester			+																											
Squalene			+												+															
Vitamin E			+	+		+									+	+	+	+	+	+	+	+								
Stigmasterol			+															+					+	+						
β -Sitosterol																									+	+	+	+		
Stigmasta-5,24(28)-dien-3-ol, (3 β)-		+		+																									+	
Ergost-7-en-3-ol, (3 β)-		+							+																					

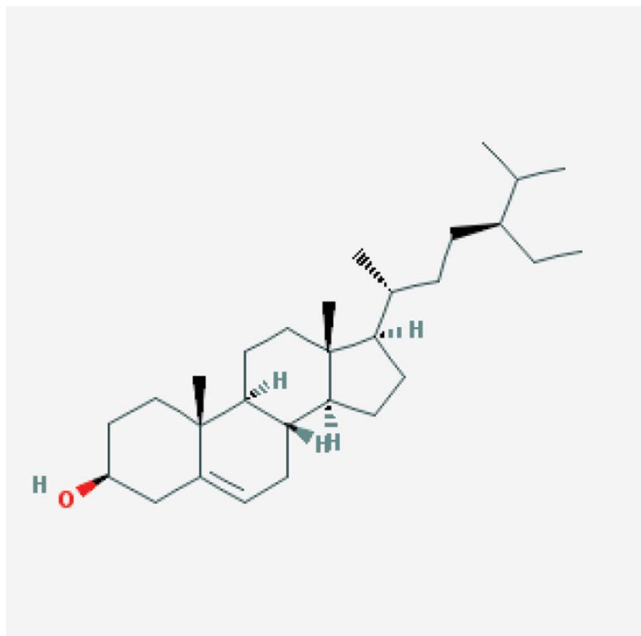


Figure 1. β -Sitosterol.

10. Hepato protective 11. Antihistaminic 12. Antieczemic
 13. Antiandrogenic 14. Antiarthritic 15. Anti-tumour
 16. Anti ageing 17. Analgesic 18. Antidiabetic 19.
 Antidermatitic 20. Antileukemic 21. Antiulcerogenic 22.
 Vasodilator 23. Antispasmodic 24. Thyroid inhibitory

25. Antiperoxidative 26. Antihyperlipoproteinaemic 27.
 Antibacterial 28. Antimicotic activity 29. Antiasthma

4. Conclusion

In GC-MS analysis, 25 active components were identified in ethanolic extract of small round variety of *M. charantia*. These active compounds help to reduce the inflammation, has hyperglycemic effect, polyurea, hypercholesterlimia, leukemia, cancer, cardiovascular disease and ulcer. They also eliminate toxic substance present in various parts of the body and thus show a positive effect on health.

5. References

1. Chakravarty HL. Cucurbits of India and their role in the development of vegetable crops; 1990.
2. Warriar PK, Nambiar VPK, Ramankutty C. Indian medicinal plants. Madras: Orient Longman Ltd; 1995.
3. Taylor L. Technical data report for bitter melon (*Momordica charantia*). Herbal Secrets of the Rainforest. 2nd ed. Sage Press Inc; 2002.
4. Bakare RI, Magbagbeola OA, Akinwande AI, Okunowo OW. Nutritional and chemical evaluation of *Momordica charantia*. J Med Plant Res. 2010; 4(21):2189–93.