International Journal of
Medicinal Chemistry & Analysis

www.ijmca.com

e ISSN 2249 - 7587
Print ISSN 2249 - 7595

GC-MS DETERMINATION OF BIOACTIVE COMPOUNDS OF *GLYCINE MAX L.* (SOYBEAN)

Dharshini [1]*, T.Thirunalasundari[2], S.Sumayaa[3]

[1]Research Scholar, Department of Food Science and Nutrition, Thassim Beevi Abdul Kader College for Women, Kilakarai, Tamil Nadu, India.
[2]Head of the Department, Department of Industrial Biotechnology, Bharathidasan University, Tiruchirappali, Tamil Nadu, India.
[3]Principal and HOD, Thassim Beevi Abdul Kader College for Women, Kilakarai, Tamil Nadu, India.

ABSTRACT

In this study, the bioactive compounds of soybean have been evaluated using GC-MS. Soybean was extracted with 99% ethanol. Extracted sample was injected, the bioactive compounds are screened. The results revealed the presence of fifteen compounds of which 9, 12, 15-octadecatrienoic acid (z,z,z) (80.20) ,Octadecanoic acid (8.72) and n-hexadecanoic acid (7.14) were the phytocomponents with high peak areas.

Keywords: Bioactive, Compounds, GC-MS, soybean, Phytocomponents.

INTRODUCTION

Soybean is known as the *"GOLDEN BEAN"* of the 20th Century. The most nutritious and most easily digested food of the bean family, the soybean is one of the richest and cheapest sources of protein. It is a staple in the diet of people and animals in numerous parts of the world today. At first, the nutrition value of soybean was attributed to its high quality protein content thus attracting considerable interest for its use in human diet [1]. Nowadays, it is known that soybeans are a rich source of phytochemicals, and many of those compounds have important beneficial effects on human and animal health. Soy protein can be a good substitute for animal products because unlike other beans, soybeans contain all the amino acids in the correct balance that is essential to good nutrition. Soy has been linked to improved heart health as well as decreased risk for some types of cancers [2]. Botanically, soybean belongs to the order Rosaceae, family Leguminosae or Papillonaceae or Fabaceae, subfamily Papilionoidae, the genus Glycine and the cultivar Glycine max. Soybean (Glycine max, L.) has been part of Southeast Asia culture for almost 2 millennia[1]. The soybean is an erect, branching plant ranging in height from several centimetres to more than 2 m (6.5 feet). The self-fertilizing flowers are white or a shade of purple. Seeds can be yellow, green, brown, black, or bicoloured [3].

All volatile organic compounds emitted from plants can originate from biogenic and or anthropogenic sources. Many plants emit substantial amounts of phytogenic volatile organic compounds which include Alkanes, Alkenes, Alcohols, Aldehydes, Ethers, Esters and Carboxylic acids [4-5]. The biological activity of volatile compounds is dependent on the synergistic or additive effects of the constituent types present at different concentrations. Defense, communication or protection against extreme environmental conditions may be the reasons for these emissions of volatile compounds [6].

MATERIALS AND METHODS

Extraction procedure: seeds of soybean were bought from Nilgris market, Coimbatore. 10gm powdered soybean was soaked in 20ml of Absolute alcohol overnight and then filtered through a Whatman® No. 41 filter paper (pore size 20 – 25 m) along with 2gm Sodium sulfate to remove the sediments and traces of water in the filtrate. Before filtering, the filter paper along with sodium

Corresponding Author: - **Dharshini** Email: shivibio@gmail.com

sulphate was wetted with absolute alcohol. The filtrate is then concentrated by bubbling nitrogen gas into the solution and was concentrated to 1ml. The extract contains both polar and non-polar phytocomponents.

Gas Chromatography–Mass Spectrometry (GC/MS) Analysis

GC/MS analysis of this extract was performed using a Perkin Elmer GC Claurus 500 system and Gas Chromatograph interfaced to a Mass Spectrometer (GC/MS) equipped with a Elite-1 fused silica capillary column (30 m × 0.25 mm ID. ×1 µMdf, composed of 100% Dimethyl poly siloxane). For GC/MS detection, an electron ionization system with ionization energy of 70 eV was used. Helium gas (99.999%) was used as the carrier gas at a constant flow rate of 1 ml/min. and an injection volume of 2 µl was employed (split ratio of 10:1). Injector temperature 250°C; Ion-source temperature 280°C. The oven temperature was programmed from 110°C (isothermal for 2 min.), with an increase of 10°C/min, to 200°C, then 5°C/min to 280°C, ending with a 9 min. isothermal at 280°C. Mass spectra were taken at 70 eV; a scan interval of 0.5 seconds and fragments from 45 to 450 Da. Total GC running time was 36 min. The relative percentages were calculated.

Characterization of Compounds

Interpretation on mass-spectrum GC-MS was conducted using the database of National institute Standard and Technology (NIST) having more 62,000 patterns. The spectrum of the unknown components was compared with the spectrum of known components stored in the NIST library. The name, molecular weight and structure of the components of the test materials were ascertained.

RESULT

Consumption of soy foods has been associated, at least in part, with lower incidences of a number of chronic diseases indicated by epidemiological studies [7]. The studies on the dynamic main beliefs in the soybean extract by GC-MS analysis clearly showed the presence of fifteen compounds (Tab-1).the active principles with their retention time (RT), molecular formula, molecular weight, concentration (peak area %) , nature of compound and activity of the compound are presented in Table-1. The GC-MS chromatogram of fifteen compounds detected was shown in Fig-1. Among the indentified phytocompounds 9, 12, 15-octadecatrienoic acid (z,z,z) (80.20%) , Octadecanoic acid (8.72%) and n-hexadecanoic acid (7.14%). Soy-based foods have been consumed in Asian countries such as China, Japan and Korea for many centuries. The lower rates of several chronic diseases in Asia, including cardiovascular diseases and certain types of cancer, have been partly attributed to consumption of large quantities of soy foods [8]. Due to these nutritional and functional facts, soybean products were included in the world's top 5 healthiest foods in magazine 'Health (2006)'. In that tetradecanoic acid, hexadecanoic acid, octadecanoic acids are among the fatty acids known to have potential antibacterial and antifungal activity. These compounds indicate their potential use for various diseases in traditional systems. Tetradecanoic acid is also called myristic acid which constitutes 60-75 percent of the fatty acid content. So it is good edible value [9].

Fig 1. Phytocomponents of alcoholic extract of soybean

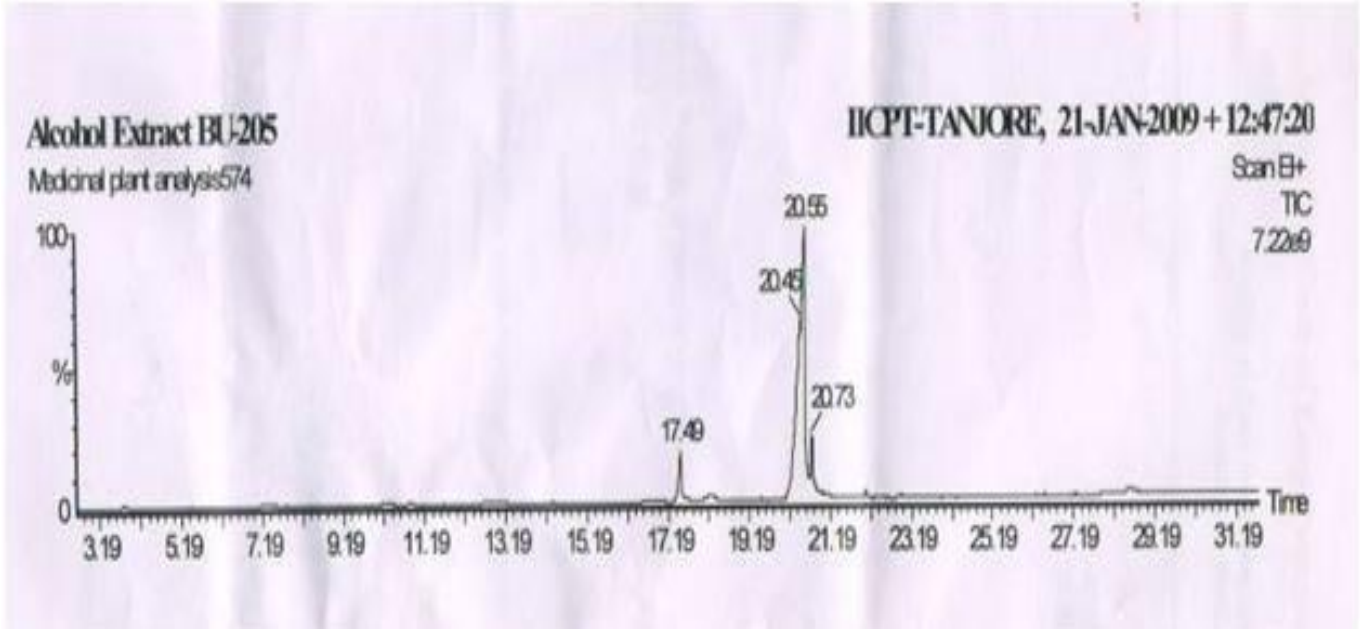
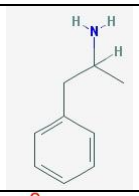
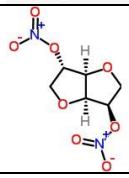
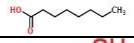
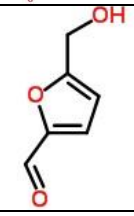
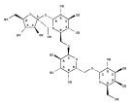
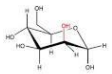
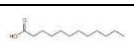
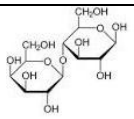
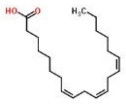


Table 1. Phytocomponents In Alcohol Extract

No	RT	Name of the compound	Molecular Formula	MW	Peak area %	Structure	Nature of the compound	Activity
1	3.78	Pentanoic acid	$C_5H_{10}O_2$	102	0.59		Valeric acid	Flavour
2	4.65	Benezeneethanamine ,α-methyl-	$C_9H_{13}N$	135	0.03		Amines	CNS stimulant
3	5.01	Isosorbide dinitrate	$C_6H_8N_2O_8$	236	0.03		1,4:3,6-Dianhydro-2,5-di-O-nitro-D-glucitol	vasodialator
4	6.39	Octanoic acid	$C_8H_{16}O_2$	144	0.06		Octanoic acid	flavour and fragrance agents
5	7.21	2-furancarboxaldehyde, 5-(hydroxymethyl)-	$C_6H_6O_3$	126	0.69		5-(Hydroxymethyl) furfural	Carbon –neutral
6	7.77	A-D-glucopyranoside, O-α-D-glucopyranosyl-1.fwdarw.3)-β-D-fructofuranosyl	$C_{18}H_{32}O_{16}$	504	0.69		Stachyose	It cause flatulence
7	10.24	d-mannose	$C_6H_{12}O_6$	180	0.48		monosaccharide	D-mannose supplements improve protein loss, liver function, low blood sugar, and blood clotting disorders in people with this condition.
8	11.64	Dodecanoic acid	$C_{12}H_{24}O_2$	200	0.02		Lauric acid	Antimicrobial properties
9	12.68	Lactose	$C_{12}H_{22}O_{11}$	342	0.50		disaccharide	Ready source of energy
10	14.35	Tetradecanoic acid	$C_{14}H_{28}O_2$	228	0.26		Myristic acid	Good immunomodulator , Flavour
11	17.49	n-hexadecanoic acid	$C_{16}H_{32}O_2$	256	7.14		Palmitic Acid	Antioxidant, hypocholesterolemicnematicide, hemolytic, 5-alpha reductase inhibitor

12	20.55	9,12,15-octadecatrienoic acid,(Z,Z,Z)-	$C_{18}H_{30}O_2$	278	80.20		Linolenic acid	Antioxidant , antimicrobial
13	20.73	Octadecanoic acid	$C_{18}H_{36}O_6$	284	8.72		Stearic acid	anticancer
14	22.07	9,12,15-octadecatrienoic acid, ethyl ester,(Z,Z,Z)_	$C_{20}H_{34}O_2$	306	0.50		Linoleic acid	Antioxidant, hypocholesterolemicne maticid
15	22.93	8,11,14-Eicosatrienoic acid,(Z,Z,Z)-	$C_{20}H_{34}O_2$	306	0.64		n-6 (omega-6) polyunsaturated fatty acid	Essential fatty acids

CONCLUSION

Some nutritional advantages could be obtained by replacing many animal based foods for soybean foods. Soybean represents an excellent source of high quality protein with a low content in saturated fat and a great amount of dietary fibre. Therefore, the possible use of soybean in functional food design is very interesting, since the consumption of soybean protein and dietary fibre seems to reduce the risk of cardiovascular diseases and to improve glycemic control. Furthermore, soybean isoflavones are associated with a potential role in the prevention and treatment of different diseases. Therefore, soybean could play an important role for the promotion of health.

ACKNOWLEDGEMENT

Authors thanks Dr.S.Kumaravel, Quality Manager, Food Testing Laboratory and the Director, Indian Institute of Crop Processing Technology (IICPT), Thanjavur for providing all the facilities and support to carry out the work. We also thanking MS.Priyanga, Asst. Professor, Department of Computer Science, Thassim Beevi Abdul Kader College for Women, Kilakarai for her support for computer application.

REFERENCES

1. Mohammad A, Mrityunjoy A. Phytochemical and nutritional health benefits of soy plant. *International Journal of Nutrition, Pharmacology, Neurological disease*, 3(1), 2013, 64-69.
2. Liu KS. Chemistry and nutritional value of soybean components. In Soybeans: Chemistry, Technology and Utilization. Aspen Publ. Inc.: Gaithersburg, Maryland, USA, 1999, 25-113.
3. ITIS Standard Report, 2010 http://www.itis.gov/itis_primer.html, http://www.itis.gov/glossary.html
4. Battino M, Greabu M, Totan A, Mohora M, Mitrea N, Totan C, Spinu T and Didilescu A. Effect of gas phase and particulate phase of cigarette smoke on salivary antioxidants. What can be the role of vitamin C and pyridoxine. *Pharma. Rep*, 59, 2007, 613-618.
5. Charles A, Stanly AL, Joseph M, Ramani VA. GC-MS Analysis of bioactive components on the bark extract of Alseodaphne semecarpifolia Nees (Lauraceae). *Asian J. Plant Science and Research*, 1(4), 2011, 25-32.
6. Ciganek M, Pisarikova B and Zraly Z. Determination of volatile organic compounds in the crude and heat treated amaranth samples. *Veterinarni Medicina*, 52(3), 2007, 111–120.
7. Kumar AR, Subburathinam KM, Prabaker G. Phytochemical screening of selected medicinal plants of asclepiadaceae family. *Asian J. Microbial. Biotechnol. Environ. Sci*, 9(1), 2007, 177-180.
8. Mateos-Aparicio A, Redondo Cuenca MJ, Villanueva-Suárez and Zapata-Revilla MA. Revisión Soybean, a promising health source. *Nutr Hosp*, 23(4), 2008, 305-312.
9. Messina MJ. Soybean foods: Their role in disease prevention and treatment. In Soybeans: Chemistry, Technology and Utilization. Chapman and Hall: New York, USA, 1997, 442-447.