

Original Research Article

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Identification of Various Chemical Compounds in Methanolic and Chloroform Crude Extracts of Groundnut Seed Coat by GC-MS

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ABSTRACT

Keywords

Groundnut seed coat, GC - MS Analysis, Chemical components.

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The present study was carried out to identify the chemical components in Methanolic and Chloroform crude extracts of groundnut seed coat by Gas Chromatography – Mass Spectrophotometry. The samples were extracted ultrasonically followed by shaking at room temperature and kept overnight at room temperature for cold extraction. Totally 10 compounds in methanolic extract and 14 compounds in chloroform extract were identified. The major compounds identified in methanolic extract of groundnut seed coat were 1, 3, 5, Benzenetriol, Cis - vaccenic acid 9,12-Octadecadienoic acid and the compounds such as catechol, Phenol, 4-butoxy, 1,3-Benzenediol, 4-propyl and oleic acid were identified in chloroform extract.

Introduction

India is the second largest producer of groundnut and its oil after china. It accounts for around 25% of the total oilseed production of the country. Groundnuts in India are mainly utilized for oil extraction followed by the production of peanut butter, roasted and salted Snacks. Nuts play a key role in the diets of human beings throughout the world. Nut by-products are generated during production and consumption and basically recognized as less market value residues. Before consumption, the groundnut seed coat was removed and regarded as waste. Over 0.74 million metric tons of groundnut seed coats are produced annually worldwide as a

by-product of the groundnut processing industry (Sobolev and Cole, 2003). Many seed coats from various crops have been reported to possess plenty of phenolic compounds. Additionally these seed coats are an inexpensive source of nutraceuticals and functional ingredients (Kamath *et al.*, 2007 and Chikane *et al.*, 2010). Groundnuts are rich source of natural procyanidins, the groundnut processing by products especially the groundnut seed coat contains a high concentration of phenolic compounds (Nepote *et al.*, 2002; Nepote *et al.*, 2004). Groundnut seed coats have an abundant amount of natural antioxidants and a high content of

dietary fiber. It is a rich source of polyphenols including procyanidins and is shown to have hypolipidemic properties (Kubicka and Troszczyńska, 2003 and Rishipal *et al.*, 2014). Three classes of compounds such as phenolic acids, flavonoids and stilbene (resveratrol) are found in groundnut seed coat extracts (Yu *et al.*, 2005). Despite being an abundant source of these health-promoting compounds, as not been exploited as a valuable natural resource. Extraction processes have been used to extract phenolic compounds from the under-utilized wastes, which can be used as nutraceuticals and functional ingredients in food industry (Wardhani *et al.*, 2010). Solvents such as methanol, ethanol, butanol, acetone, chloroform and water have been commonly used for extraction of phenolics from plants (Lopez *et al.*, 2011). Identifying valuable compounds in groundnut seed coat results in complete utilization and provides possible way to use as a natural alternative to synthetic preservatives in food processing.

Materials and Methods

Collection of groundnut seed coat and preparation of extract

Groundnut seed coat is one of the major by-product in groundnut chikkis industries in Tamil Nadu. It was collected from laxmi villas chikkis processing unit located in oomachikulam of Madurai district, Tamil Nadu.

The collected sample was converted into powder and 10 g of sample was extracted with 100 ml of HPLC grade methanol and chloroform in ultrasonic bath for 30 min at 27° C followed by continuous shaking in shaker for 6 hours at 300 RPM in room temperature and then the extract was filtered through 0.22 µm membrane filter and directly injected into GC-MS system.

Analytical conditions for GC-MS

GC-MS analysis was carried out in a Shimadzu QP 2020 GC - MS System, fitted with Rxi - 5 Sil MS fused silica column cross bonded with 1, 4 - bis (dimethylsiloxy) phenylene dimethyl polysiloxane. The column length is 30 meters, inner diameter was 0.25 mm and film thickness is 0.25 µm. The maximum temperature limit for column was 320 °C. Ultra-high purity helium (99.99%) was used as carrier gas at a constant flow rate of 1.0 mL/ min. The injection, transfer line and ion source temperatures were 260 °C, 290 °C and 230 °C. The ionizing energy was 70 eV. Electron multiplier voltage was obtained from auto tune. The oven temperature was programmed from 60 °C (hold for 2 min) to 290 °C at a rate of 5 °C / min. 1.0 µL of sample was injected into the system in split mode and the split ratio of 30: 1. All data were obtained by collecting the full-scan mass spectra within the scan range 45-550 amu. The identification and characterization of chemical compounds in various crude extracts was based on GC retention time. The obtained mass spectra were computer matched with those of standards available in NIST mass spectrum libraries.

Result and Discussion

In the present study the chemical components in methanolic and chloroform extracts in groundnut seed coat were analyzed by GC-MS. The results revealed that there are ten compounds were identified in methanolic extract of groundnut seed coat. It contains the bio active compounds such as hexanal, it has strong antimicrobial activity against various food borne pathogens and more frequently used in shelf life improvement and preservation of processed foods, 1, 3, 5 – Benzenetriol was used in treatment of various gastrointestinal disorders, 2,4-Decadienal is an aromatic substance found in various

processed foods especially groundnuts and gives deep fat flavour, 9,12-Octadecadienoic acid is an omega 6 and essential fatty acid and Cis - vaccenic acid is an omega-7 fatty acid and it has anti - carcinogenic properties (Fig. 1 and Table 1).

In chloroform extract the compounds such as catechol, Phenol, 4-butoxy, 1,3, 5-

Benzenetriol and many fatty acid components such as n-Hexadecanoic acid, 9,12-octadecadienoic acid, oleic acid, 6-Octadecenoic acid is a monounsaturated omega-12fatty acid, fumaric acid, 4-octyl and Eicosanoic acid, octadecyl ester were identified (Fig. 2 and Table 2).

Table.1 Compounds identified in methanolic extract of groundnut seed coat by GC-MS

S.No	Retention Time	Compound Name	Area	Area %
1.	4.346	Hexanal	47747	3.36
2.	15.682	Benzofuran, 2,3-dihydro	94726	6.67
3.	15.802	5-Hydroxymethyl furfural	85123	5.99
4.	18.725	2,4-Decadienal	29716	2.09
5.	25.756	1,3,5 - Benzenetriol	287349	20.23
6.	30.854	2-Hydroxy-5-methylisophthalaldehyde	133921	9.43
7.	34.319	n-Hexadecanoic acid	282846	19.91
8.	37.727	9,12-Octadecadienoic acid	142065	10.00
9.	37.854	Cis - vaccenic acid	238654	16.80
10.	45.148	Cyclononasiloxane, octadecamethyl	78412	5.52

Table.2 Compounds identified in chloroform extract of groundnut seed coat by GC-MS

S.No	Retention Time	Compound Name	Area	Area %
1.	14.608	Catechol	184124	3.84
2.	14.635	Phenol, 4-butoxy	109008	2.27
3.	24.820	1,3,5-Benzenetriol	433823	9.04
4.	25.089	1,3-Benzenediol, 4-propyl	255793	5.33
5.	29.596	2-Hydroxy-5-methylisophthalaldehyde	212818	4.43
6.	32.908	n-Hexadecanoic acid	491650	10.24
7.	36.140	9,12-Octadecadienoic acid	219505	4.57
8.	36.260	Oleic Acid	644570	13.43
9.	36.360	6-Octadecenoic acid	102676	2.14
10.	41.744	Bis(2-(Dimethylamino)ethyl) ether	80824	1.68
11.	41.982	9-Octadecenoic acid	127949	2.67
12.	45.675	Decanedioic acid, dimethyl ester	142699	2.97
13.	45.780	Fumaric acid, 4-octyl	147153	3.03
14.	45.840	Eicosanoic acid, octadecyl ester	222887	4.64

Fig.1 Chromatogram of methanolic extract of groundnut seed coat

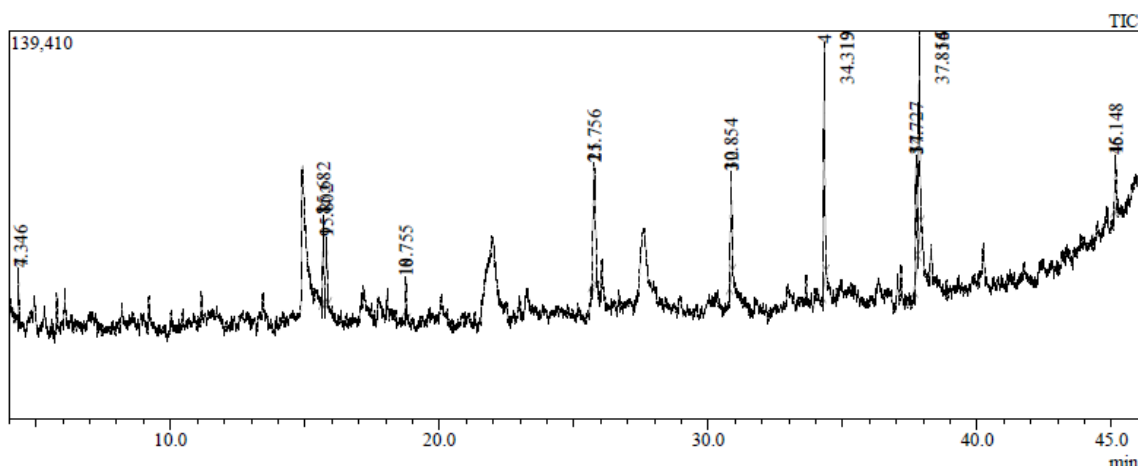
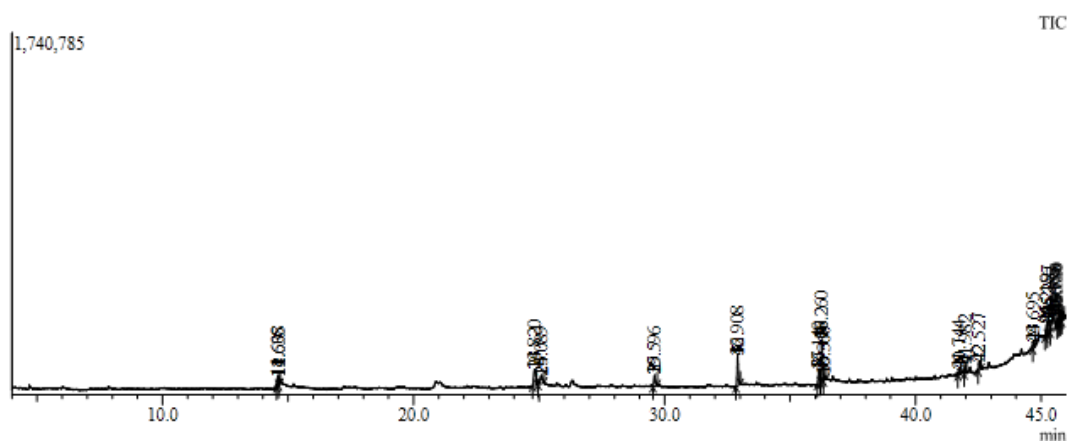


Fig.2 Chromatogram of chloroform extract of groundnut seed coat



In conclusion, plants contains variety of phytochemical components, many of them are biologically active compounds and known to have pharmacological activities (Gu *et al.*, 2014). The bioactive secondary metabolites have been shown to reduce the risk and progression of diseases such as cancer, cardiovascular, neurodegenerative diseases, *etc.* by scavenging free radicals through various biological mechanisms (Ansari and Khodaghali, 2013). The results of GC-MS indicated that groundnut seed coat contained numerous bioactive components belongs to various classes such as Polyphenols, alkaloids, flavonoids, steroids and it has some fatty acids that will provide health benefits. The groundnut seed coat contains various antioxidants. So, the more efficient utilization

of groundnut seed coat benefit industry and health of the people and the utilization of groundnut seed coat as a renewable raw material for antioxidant compounds will provide protection and enhancement against various life style diseases, while it can also be used as an inexpensive source of polyphenols in foods and dietary supplements.

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