Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

**E-ISSN:** 2278-4136
**P-ISSN:** 2349-8234
JPP 2019; 8(3): 4406-4409
Received: 28-03-2019
Accepted: 30-04-2019

**N Revathi**
Research Scholar, PG and Research Department of Biochemistry, Marudupandiyar College, Tamil Nadu, India

**TS Dhanaraj**
PG and Research Department of Biochemistry, Marudupandiyar College, Tamil Nadu, India

**Correspondence**
**N Revathi**
Research Scholar, PG and Research Department of Biochemistry, Marudupandiyar College, Tamil Nadu, India

# Evaluation of bioactive phytochemicals in leaves extract of *Dodonaea angustifolia* using gas chromatography and mass spectroscopic technique

**N Revathi and TS Dhanaraj**

**Abstract**
The aim of this study was to carry out for identification of bioactive compounds from the methanolic extract of *Dodonaea angustifolia* leaves by Gas chromatography and Mass spectroscopy (GC-MS). GCMS analysis of methanolic extract was done by standard protocol using the equipment Perkin-Elmer Gas Chromatography–Mass Spectrometry. Twenty eight were identified in *Dodonaea angustifolia* by GC-MS analysis. The GC-MS analysis revealed the presence of various compounds like hexadecanoic acid, methyl ester and 9, 12, 15-octadecatrienoic acid, methyl ester in the methanolic extract of *Dodonaea angustifolia*. These findings support the traditional use of *Dodonaea angustifolia* in various disorders.

**Keywords:** Gas chromatography and mass spectroscopy, *Dodonaea angustifolia,* phytochemistry

## 1. Introduction
Phytochemistry or plant chemistry has developed in recent years as a distinct discipline, somewhere in between natural product organic chemistry and plant biochemistry and is closely related to both. It is concerned with the enormous variety of organic substances that are elaborated with and accumulated by plants and deals with the chemical structures of these substances, their biosynthesis, turn over and metabolism, their natural distribution and their biological function (Sathyaprabha *et al*., 2010) [1]. Plants have been an important source of medicine with qualities for thousands of years. Plants are used medicinally in different countries, and they are the source of many potent and powerful drugs. Mainly on traditional remedies such as herbs for their history, they have been used as popular folk medicines (Mathekaga, and Meyer, 1998) [2] It has been shown that *in vitro* screening methods could provide the needed preliminary observations necessary to elect crude plant extracts with potentially useful properties for further chemical and pharmacological investigations (Harborne, 1986 [3].

Phytochemicals are the chemicals extracted from plants. These organic chemicals are classified as primary or secondary constituents, depending on their role in plant metabolism. Primary constituents include the common sugars, amino acids, proteins, purines and pyrimidines of nucleic acids, chlrophyll's etc. Secondary constituents are the remaining plant chemicals such as alkaloids (derived from aminoacids), terpenes (a group of lipids) and phenolics (derived from carbohydrates) (Liu, 2004) [4]. Plant produces these chemicals to protect itself but recent research demonstrates that emphasizes the plant source of most of these protective, disease-preventing compounds. A true nutritional role for phytochemicals is becoming more probable every day as research uncovers more of their remarkable benefits (Hamburger and Hostettmann, 1991) [5]. Within a decade, there were a number of dramatic advances in analytical techniques including TLC, UV, NMR and GC-MS that were powerful tools for separation, identification and structural determination of phytochemicals (Roberts and, Xia, 1995) [6].

The chosen medicinal plant namely as *Dodonaea angustifolia* leaves belongs to the Sapindaceae family (Orwa *et al*., 2009) [7]. The biological activity was screened against the microorganisms causing skin allergies, diarrhea and dysentery. A recent study with methanol extract of mature leaves reported anti-inflammatory and antinociceptive activity (Merish *et al*., 2014 Sadique *et al*., 1987, Chatterjee, 1990, Nadkarni, 1982, Nadkarni, 2003, Asolkar, 1992) [8-13]. The aim of this study is to determine the organic compounds present in the *Dodonaea angustifolia* extract with the aid of GC-MS Technique, which may provide an insight in its use in tradition medicine.

## 2. Material and Methods

**2.1 Plant materials:** The plant of *Dodonaea angustifolia* leaves were collected in December 2017 from Tamil University Campus, Thanjavur District, Tamil Nadu, India from a single herb. The leaves were identified and authenticated by Dr. S. John Britto, The Director, the Rabiant Herbarium and centre for molecular systematics, St. Joseph's college Trichy-Tamil Nadu. India. A Voucher specimen has been deposited at the Rabinat Herbarium, St. Josephs College, Thiruchirappalli, Tamil Nadu, India.

### 2.2 Preparation of extracts

The collected *Dodonaea angustifolia* leaves were washed several times with distilled water to remove the traces of impurities from the leaves. The plant was dried at room temperature and coarsely powdered. The powder was extracted with methanol for 48 hours. A semi solid extract was obtained after complete elimination of alcohol under reduced pressure. The extract was stored in desiccator until used. The extract contained both polar and non-polar phytocomponents of the plant material used.

### 2.3 GC –MS analysis

GC-MS analysis was carried out on a GC clarus 500 Perkin Elmer system comprising a AOC-20i autosampler and gas chromatograph interfaced to a mass spectrometer instrument employing the following conditions: column Elite-1 fused silica capillary column (30 x 0.25mm ID x 1µMdf, composed of 100% Dimethyl polydiloxane), operating in electron impact mode at 70eV; Helium gas (99.999%) was used as carrier gas at a constant flow of 1 ml /min and an injection volume of 0.5 µI was employed (split ratio of 10:1) injector temperature 250 ºC; ion-source temperature 280 ºC. The oven temperature was programmed from 110 ºC (isothermal for 2 min), with an increase of 10 ºC/min, to 200 ºC, then 5 ºC/min to 280 ºC, ending with a 9min isothermal at 280 ºC. Mass spectra were taken at 70eV; a scan interval of 0.5 seconds and fragments from 40 to 450 Da. Total GC running time is 36min. min. The relative percentage amount of each component was calculated by comparing its average peak area to the total areas. Software adopted to handle mass spectra and chromatograms was a TurboMass Ver 5.2.0

## 3. Results and Discussion

Plants have an almost limitless ability to synthesize aromatic substances, most of which are phenols or their oxygen substituted derivatives. Most are secondary metabolites, of which at least 12,000 have been isolated, a number estimated to be less than 10% of the total. These substances serve as plant defense mechanisms against, insects and herbivores. Flavonoids exhibit several biological effects such as anti-inflammatory, anti-fungal, anti-hepatotoxic and anti-ulcer actions (de-Fatima *et al*., 2006) [14].

### 3.1 Identification of components

Interpretation on mass spectrum GC-MS was conducted using the database of National Institute Standard and Technology (NIST) having more than 62,000 patterns. The spectrum of the unknown component was compared with the spectrum of the known components stored in the NIST library. The name, molecular weight and structure of the components of the test materials were ascertained. The biological activities listed (Table 2) are based on Dr.Duke's Phytochemical and Ethnobotanical Databases by Dr. Jim Duke of the Agricultural Research Service/USDA.

### 3.2 GC-MS Analysis

Twenty eight were identified in *Dodonaea angustifolia* by GC-MS analysis. The active principles with their retention time (RT), molecular formula, molecular weight (MW) and concentration (%) are presented in (Table 1 and Fig 1). the prevailing compounds were the GC-MS analysis revealed the presence of various compounds like Hexadecanoic acid, methyl ester and 9,12,15-Octadecatrienoic acid, methyl ester. Table 2 represent the biological activity of phyto-components identified in the methanolic extracts of *Dodonaea angustifolia* leaves by GC-MS.

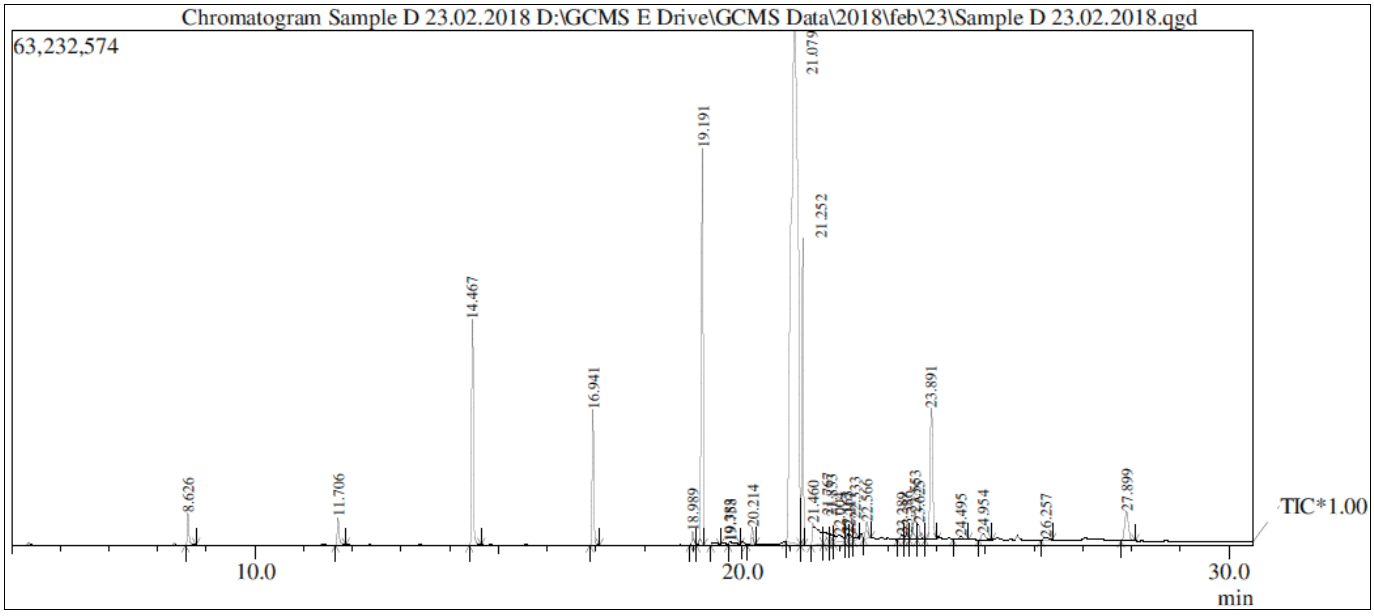


**Fig 1:** Chromatogram obtained from the GC/MS with the extract of *Dodonaea angustifolia* leaves.

**Table 1:** Shows the components identified in methanolic extract of *Dodonaea angustifolia* leaves (GC-MS study)

| Peak# | R. Time | Area% | Molecular formula | Molecular weight | Molecular Name |
|---|---|---|---|---|---|
| 1 | 8.626 | 0.84 | $C_9H_{18}O_2$ | 158 | Methyl octanoate |
| 2 | 11.706 | 0.80 | $C_{11}H_{22}O_2$ | 186 | Decanoic acid, methyl ester |
| 3 | 14.467 | 6.12 | $C_{13}H_{26}O_2$ | 214 | Dodecanoic acid, methyl ester |
| 4 | 16.941 | 3.41 | $C_{15}H_{30}O_2$ | 242 | Methyl tetradecanoate |
| 5 | 18.989 | 0.41 | $C_{17}H_{32}O_2$ | 268 | 7-Hexadecenoic acid, methyl ester |
| 6 | 19.191 | 11.00 | $C_{17}H_{34}O_2$ | 270 | Hexadecanoic acid, methyl ester |
| 7 | 19.383 | 0.25 | $C_{17}H_{34}O_2$ | 270 | Pentadecanoic acid, 14-methyl-, methyl ester |
| 8 | 19.758 | 0.29 | $C_{11}H_{17}Br$ | 228 | 1-(bromomethylene)decahydronaphthalene |
| 9 | 20.214 | 0.42 | $C_{18}H_{36}O_2$ | 284 | Heptadecanoic acid, methyl ester |
| 10 | 21.079 | 54.00 | $C_{19}H_{36}O_2$ | 296 | 9-Octadecenoic acid, methyl ester, (E) |
| 11 | 21.252 | 6.05 | $C_{19}H_{38}O_2$ | 298 | Methyl stearate |
| 12 | 21.460 | 2.31 | $C_{19}H_{34}O_2$ | 294 | 17-Octadecynoic acid, methyl ester |
| 13 | 21.767 | 0.83 | $C_{19}H_{36}O_2$ | 296 | 9-Octadecenoic acid (Z)-, methyl ester |
| 14 | 21.833 | 0.39 | $C_{10}H_{16}O_2$ | 168 | 2,6,6-trimethyl-1-cyclohexene-1-carboxylic acid |
| 15 | 22.004 | 0.86 | $C_{19}H_{34}O_2$ | 294 | 9,12-Octadecadienoic acid |
| 16 | 22.163 | 0.29 | $C_{20}H_{38}O_2$ | 310 | 10-Nonadecenoic acid, methyl ester |
| 17 | 22.217 | 0.26 | $C_{20}H_{38}O_2$ | 310 | Cis-10-Nonadecenoic acid, methyl ester |
| 18 | 22.333 | 0.20 | $C_{10}H_{20}O$ | 156 | Cyclohexanol, 5-methyl-2-(1-methylethyl)-, (1.alpha., 2.alpha., 5.beta.) |
| 19 | 22.566 | 0.66 | $C_{20}H_{36}O_4$ | 340 | Methyl (11R,12R,13S)-(Z)-12,13-epoxy-11-methoxy-9-octadecenoate |
| 20 | 23.289 | 0.25 | $C_{19}H_{36}O_3$ | 312 | Oxiraneoctanoic acid, 3-octyl-, methyl ester, trans |
| 21 | 23.386 | 0.26 | $C_{25}H_{52}$ | 352 | Pentacosane |
| 22 | 23.553 | 1.44 | $C_{21}H_{40}O_2$ | 324 | Cis-11-Eicosenoic acid, methyl ester |
| 23 | 23.625 | 0.60 | $C_{17}H_{32}O$ | 252 | 8-Hexadecenal, 14-methyl-, |
| 24 | 23.891 | 5.49 | $C_{21}H_{42}O_2$ | 326 | Methyl 18-methylnonadecanoate |
| 25 | 24.495 | 0.22 | $C_{15}H_{26}O$ | 222 | 2-Butyl-3-methyl-5-(2-methylprop-2-enyl) cyclohexanone |
| 26 | 24.954 | 0.42 | $C_{19}H_{32}O_2$ | 292 | 9,12,15-Octadecatrienoic acid, methyl ester, |
| 27 | 26.257 | 0.23 | $C_{15}H_{26}O$ | 222 | 1,1,4a,7-tetramethyl-2,3,4,4a,5,6,7,8-octahydro-1h-benzo[a]cyclohepten-7-ol |
| 28 | 27.899 | 1.72 | $C_{23}H_{46}O_2$ | 354 | Docosanoic acid, methyl ester |

**Table 2:** Activity of phyto-components identified in methanolic extracts of the *Dodonaea angustifolia* leaves by GC-MS.

| | |
|---|---|
| Hexadecanoic acid, methyl ester | Antioxidant, Flavor, Hypocholesterolemic Pesticide, 5-Alpha reductase inhibitor |
| 9,12,15-Octadecatrienoic acid, methyl ester | Antiinflammatory, Hypocholesterolemic, Cancer preventive, Hepatoprotective, Nematicide, Insectifuge Antihistaminic, Antiarthritic, Anticoronary, Antieczemic Antiacne, 5-Alpha reductase inhibitor Antiandrogenic, |

**Source:** Dr.Duke's phytochemical and ethnobotanical databases [Online database].

The GC-MS analysis of chemical constituents of the methanolic tuber extract of *Dodonaea angustifolia* clearly showed the presence of 28 chemical constituents. The results indicated that the tuber extracts of M. cymbalaria possess many chemical constituents and it can be used for the treatment of various diseases and is recommended as a plant of phyto-pharmaceutical importance. So that those might be utilized for the development of traditional medicines and further investigation needs to elute novel active compounds from the medicinal plants which may be created a new way to treat many incurable diseases and is recommended as a plant of phyto-pharmaceutical importance.

## 4. Reference


1. Sathyaprabha G, Kumaravel S, Ruffina D, Praveenkumar P. A comparative study on antioxidant, proximate analysis, antimicrobial activity and phytochemical analysis of *Aloe vera* and *Cissus quadrangularis* by GC-MS. J Pharma Res. 2010; 3:2970-3.
2. Mathekaga AD, Meyer JJM. Antibacterial activity of South African *Helichrysum* species. South Afr J Bot. 1998; 64:293-5.
3. Harborne JB. Plant flavonoids in biology and medicine: Biochemical pharmacological, and structure–activity relationships. NY, USA: Alan R. Liss. 1986, 15-24.
4. Liu RH. Potential synergy of phytochemicals in cancer prevention: Mechanism of action. Journal of Nutrition. 2004; 134(12 Suppl.):3479S-3485S.
5. Hamburger M, Hostettmann K. Bioactivity in plants: the link between phytochemistry and medicine. Phytochemistry. 1991; 30:3864È74.
6. Roberts JKM, Xia JH. High-resolution NMR methods for study of higher plants, Methods Cell Biol. 1995; 49:245-258.
7. Orwa C, Mutua A, Kindt R, Jamnadass R, Anthony S. Agroforestree Database: a tree reference and selection guide version 4.0, 2009. (http://www.worldagroforestry.org/sites/treedbs/treedatabases.asp)
8. Merish S, Tamizhamuthu M, Walter TM. Review of *Mollugo cerviana* with special reference to traditional Siddha medicine. Research and Reviews: Journal of Pharmacognsoy and Phytochemistry. 2014; 2(1):5-10.
9. Sadique J, Chandra T, Thenmozhi V, Elango V. The anti-inflammatory activity of *Enicostemma littorale* and *Mollugo cerviana*. Biochem Med Metab Biol. 1987; 37(2):167-76.
10. Chatterjee A. Treaties of Indian Medicinal Plants, Council for Scientific and Industrial Research, New Delhi, India, 1990, 327.
11. Nadkarni KM, Nadkarani AK. Indian Material Medica, Popular Prakashan, Bombay. 1982; I:531.

12. Auddy B, Ferreira M, Blasina F, Lafon F, Arredondo F, Dajas F *et al.* J Ethnopharmacol. 2003; 84:131-138.
13. Asolkar LV, Kakkar KK, Chakre OJ. Second Supplement to Glossary of Indian Medicinal Plant with Active Principles, NISCAIR, New Delhi, India, 1992, 1965-1985.
14. De-Fatima A, Modolo LV, Conegero LS, Pilli RA, Ferreira CV, Kohn LK *et al*. Lactones and their derivatives: biological activities, mechanisms of action and potential leads for drug design. Curr. Med. Chem. 2006; 13:3371-3384.