WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.084
Volume 9, Issue 3, 882-889. Research Article ISSN 2277– 7105

GAS CHROMATOGRAPHY AND MASS SPECTROSCOPY ANALYSIS OF PHYTOCHEMICAL SCREENING AND BIOLOGICAL ACTIVITIES IN THE METHANOLIC LEAF EXTRACTS OF *BRASSAIOPSIS BODINIERI* (H.Lév.) J. Wen & Lowry

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Article Received on
19 Dec. 2019,
Revised on 09 Jan. 2020,
Accepted on 29 Feb. 2020,
DOI: 10.20959/wjpr20203-16843

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ABSTRACT

The presence of diverse secondary metabolites has been reported from species of the family Araliaceae. However, not much information has been available on phytochemical components and biological activity in the methanol extract of *Brassaiopsis bodinieri* leaves. The present study aims at to actuate the phytochemical compounds of *Brassaiopsis bodinieri* leaves using Gas Chromatography Mass Spectrometry. Eight bioactive chemical compounds were identified in the methanolic extract. The identification of bioactive chemical compounds is based on the peak area, retention time, molecular weight, molecular formula and chemical structure. GC-MS analysis of *B. bodinieri* revealed the existence of the cyclopentasiloxane decamethyl (94.57%); cyclopentasiloxane dodecamethyl(95.6%); tetradecamethylcyclohepta-siloxane (95.58%); 2,4-di tert-butylphenol (55.5%); 2,2,4-Trimethyl -1, 3- pentane-dioldiisobutyrate (81.8%); hexadecamethylcyclooctasiloxane (93.42%); Octadeca-methylcyclononasiloxane (83.47%) and Dibutyl phthalate (10.3%). The biological activities of these eight bioactive compounds were also revealed in this present research work.

KEYWORDS: *Brassaiopsis bodinieri,* GC-MS, Bioactive compounds, Biological activity.

INTRODUCTION

The medicinal use of the compounds of natural products derived from natural sources such as plants, animals or microorganisms precede recorded human history probably by thousands of years.[1] Plants are capable of synthesizing an overwhelming variety of low-molecular weight organic compounds called secondary metabolites, usually with unique and complex structures. Many metabolites have been found to possess interesting biological activities and found applications as pharmaceuticals, insecticides, dyes, flavours and fragrances. Plants used for traditional medicine contain a wide range of substances that can be used to treat chronic as well as infectious diseases.[2] *Brassaiopsis bodinieri*, (locally known as Chom), which was identified and named by. J. Wen and Lowry in 2006[3], belongs to the family Araliaceae. The plants are shrubs to small trees, 3 to 8 m tall with prickly branches and sparsely branched stems. Leaves are simple, 7-11-lobed; petiole 15-35 cm, with small scattered prickles. Leaf blade 18-40 cm wide, papery to membranous; palmately lobed with 7-22 cm divided to half or two thirds of the way to the base of the leaf or deeply divided when mature. Lobes elliptic to narrowly obovate, adaxially glabrous or with sparse short setae, base truncate to cordate, margin serrulate, teeth narrowly triangular to blunt, apex acuminate. Inflorescence a panicle of compound umbels, with setose trichomes to 3 mm; primary axis 10-25 cm; secondary axes 6-24 cm, with a terminal umbel of bisexual flowers; peduncles 1-2 cm; umbels 0.8-1 cm in diam.; pedicels 10-18 mm, finely brown to ferruginous stellate, glabrescent and ovary 2-carpellate. Fruit ellipsoid, ca 7mm; styles persistent, ca 2.5 mm.

Gas Chromatography and Mass Spectroscopy (GC-MS) is one of the techniques to identify the bioactive constituents of long chain hydrocarbons, alcohols, acids, esters, alkaloids, steroids, amino and nitro compounds etc.[4] GC-MS is a method that combines the features of gas-liquid chromatography and mass spectrometry to identify different substances within a tests sample. However, few reports are available with respect to the pharmacological properties of plants. A wide range of medicinal plant parts is used for extraction as raw drugs and they possess varied medicinal properties.[5] Traditionally used medicinal plants have recently attracted the attention of the biological scientific communities. Henceforth, the present work emphasized on isolation of phytochemical compounds of *Brassaiopsis bodinieri* by GC-MS spectral peak with their biological activity.

MATERIAL AND METHODS

Collection of Plant Materials

The fresh plant leaf material of *Brassaiopsis bodinieri* was collected from the natural habitats from Phayeng Makha Leikai, Phayeng, Imphal West District, Manipur. These plants was mostly distributed in Phayeng, Senapati, Kamjong, Churanchandpur, Nambol and Langol of Manipur identified and authenticated by Dr. D.S. Ningombam, Assistant Professor, Department of Botany, Jadonang Memorial College, Noney, Manipur. Voucher Specimen herbarium has been deposited at the Department of Botany, Thoubal College, Thoubal, Manipur (Voucher Specimen No. 1001).

Preparation of Extracts

The collected fresh leaves were dried in the shade under room temperature so as to prevent decomposition of active principle and chopped into small pieces and made fine powder by using mortar and pestle.[6] About 1 kg of powdered plant material was soaked in 5 litre of methanol in round bottle flask and kept a week for extraction and then filtered through Whatman's filter paper No. 41. After filtration, extraction solvent was removed under reduced pressure using rotary evaporator set at 40^0C. The dried extracts were stored for further use. The methanol crude extract obtained was sent for GC-MS analysis at Quality Research and Analytical Labs. Pvt. Ltd., Patparganj, New Delhi using Shimadzu GC-MS QP 2010 for the determination of phytochemical bioactive compounds.

Identification of Phytochemical Compounds

Interpretation on mass spectrum of GC-MS was done using the database of National Institute Standards and Technology (NIST) having more than 62,000 patterns. The mass spectrum of the unknown compound was compared with spectrum of known compounds stored in NIST library. Quantitative determinations were made by relating respective peak areas to total ion current (TIC) areas from the GC-MS. The name, molecular weight, retention time and peak area percentage of the tests materials was ascertained.

RESULTS

GC-MS chromatogram of the methanolic leaf extract of *B.bodinieri* shows 8 peaks indicating presence of eight compounds (Fig.1). The active principles with their compound name, retention time (RT), percentage of concentration, molecular weight, molecular formula, molecular structure and biological activities are in Table 1. It is revealed that cyclopentasiloxane decamethyl (94.57%); cyclohexasiloxane dodecamethyl (95.6%);

tetradecamethylcycloheptasiloxane (95.58%); 2, 4-di tert –butyl phenol (55.5%); 2, 2, 4-Trimethyl -1, 3- pentanediol diisobutyrate (81.8%); Hexadecamethylcyclooctasiloxane (93.42%); octadecamethylcyclononasiloxane (83.47%) and Dibutyl phthalate (10.3%). The medicinal and biological activities like antimicrobial, antibacterial, antioxidant, antifungal, anti-inflammatory etc. were found to the eight phytochemical active compounds revealed in the *B.bodinieri.*

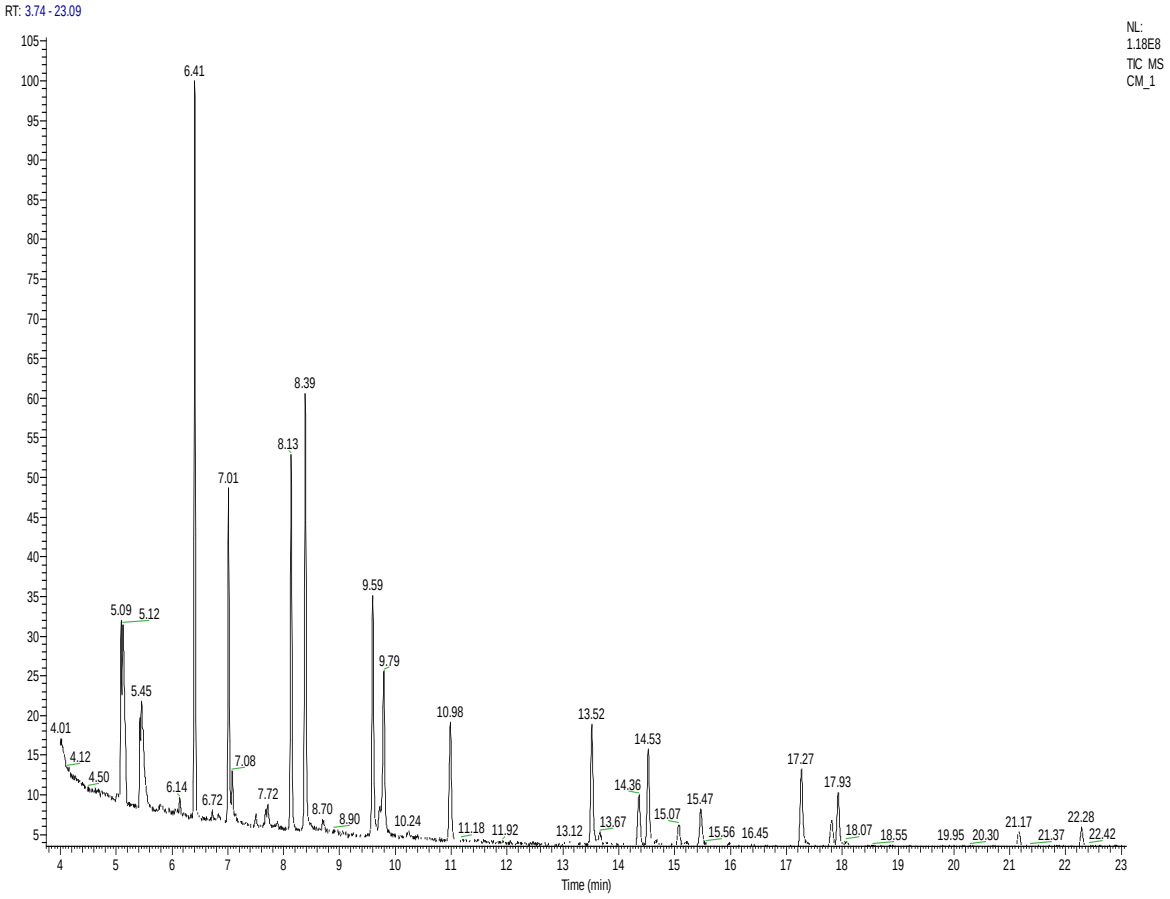
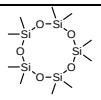
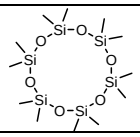
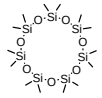
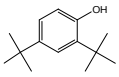
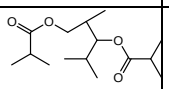
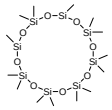
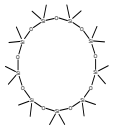
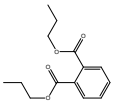


Fig. 1: GC-MS Chromatogram of methanolic extract of *Brassaiopsis bodinieri.*

Table 1: Phytochemical compounds in the leaf extract of *B. bodinieri.*

SI. No.	Compound Name	RT	% of Peak Area	Molecular Weigh	Molecular Formula	Molecular Structure	Biological Activity
1.	Cyclopentasiloxane, decamethyl	5.09	94.57	370.76	$C_{10}H_{30}O_5Si_5$		Antimicrobial
2.	Cyclohexasiloxane, dodecamethyl	6.41	95.6	444.92	$C_{12}H_{36}O_6Si_6$		Antipersipirant, Antibacterial, Antifungal
3.	Tetradecamethylcycloheptasiloxane	8.14	95.58	519.08	$C_{14}H_{42}O_7Si_7$		Antioxidant
4.	2, 4-di-tertbutyphenol	8.36	55.5	206.32	$C_{14}H_{22}O$		Antifungal, Antioxidant, Antibacterial
5.	2,2,4-Trimethyl-1,3-pentanediol diisobutyrate	9.79	81.8	286.41	$C_{16}H_{30}O_4$		Plasticizer
6.	Hexadecamethylcyclooctasiloxane	10.99	93.42	593.2	$C_{10}H_{30}O_5Si_5$		Antioxidant, Antibacterial
7.	Octadecamethylcyclononasiloxane	14.35	83.47	667.4	$C_{10}H_{30}O_5Si_5$		Anti-inflammatory, Antiarthritic
8.	Dibutyl phthalate	10.3	17.26	278.34	$C_{16}H_{22}O_4$		Antibacterial, Antimicrobial, Antifouling

DISCUSSION

The present study revealed that the leaves of *B.bodinieri* were screened for phytochemical active compounds and analysed by GC-MS. The GC-MS analysis revealed that the methanolic extract is mainly composed of oxygenated hydrocarbons, alkane hydrocarbons and predominantly phenolic hydrocarbons and tannins. These phytochemicals are responsible for various pharmacological actions such as hepatoprotective, antioxidant, wound healing, and antimicrobial activities etc.[7]

The highest peak is due to the presence of cyclohexasiloxane dodecamethyl having the peak area of 95.6% with retention time of 6.41. The compound was also reported in the previous works of different workers who carried out research on GC-MS analysis of phytochemical compounds of normal and leaf galls of *Madhuca longifolia* (Koening)[8] and GC-MS analysis

on *Drynaria quercifolia*.[9] These compounds were found to possess different biological activities like antiperspirant, antibacterial, antifungal.

The compound tetradecamethylcycloheptasiloxane has the second highest peak (95.58%) with retention time of 8.14 which possess antioxidant property. These phytochemical compounds were also recorded in the GC-MS analysis of *Solanum incanum* (L.) which was collected from the Tamil Nadu[10] and *Pergularia daemia* (Forssk) Chiov.[11]

The compound cyclopentasiloxane decamethyl with retention time 5.09 and peak area percentage of 94.57 was found to possess antimicrobial activity. It is in accordance with the work carried out in the GC-MS analysis of *Thymelaea hirsuta* L.[12] and GC-MS analysis for characterisation of alkaloids constitution and evaluation of antimicrobial activity of *Solanum nigrum.*[13]

The compound Hexadecamethylcyclooctasiloxane was the fourth less prominent peak 93.42% with retention time of 10.99 which possess antioxidant and antibacterial activity. The previous work carried out by different workers reported these compounds in the GC-MS analysis of *Solanum incanum*[10] and *Drynaria quercifolia.*[9]

The next compound was Octadecamethylcyclononasiloxane with peak area 83.47 having retention time of 14.35 which possess anti-inflammatory and antiarthritic activities. These findings are in accordance with the pharmacological profile of the extracts since flavanoids were reported to inhibit the Cyclooxygenase and lipoxygenase pathways of arachidonate metabolism[14] while catchins have many biological functions including anti-inflammatory, anti-oxidative and anticarcinogenic effects.

The compound 2, 2, 4-Trimethyl -1, 3- pentanedioldiisobutyrate has peak area of 81.8% with 9.79 retention times which possess plasticizer activity. This work was in accordance with the study carried out the biologically active agent compositions of *Salicornia europaea* which was allowed to use in pharmacology.[15]

The compound 2, 4-di tert-butylphenol has peak area 55.5% with retention time 8.38 which showed antifungal, antioxidant and antibacterial activities. The compound Dibutyl phthalate shows the lowest peak area 10.3% with retention time 17.26 which possess antibacterial, antifouling and antimicrobial activities. These compounds were found among the twelve compounds present in the whole plants of *Polygala rosmarinifolia* by GC-MS analysis.[16]

CONCLUSION

The presence of eight bio-active phytochemical compounds detected after GC-MS analysis using the methanol crude extract of the leaves of *B.bodinieri* justifies the use of leaves for various purposes by traditional practitioner. These phytochemical compounds have varied pharmacological activities. Additionally, these plant extracts could be examined in vitro for better understanding of their safety and efficacy. The leaves of this plant would be used as a health supplement and medicinal uses. This will be able to use in our local area as effective medicines with probably fewer side effects. The biological activities of the phytochemical active compounds of *B. bodinieri* would be analysed in depth to discover new drugs for future generation.

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