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Research Article

# GC-MS ANALYSIS OF SOME BIOACTIVE CONSTITUENTS OF THE LEAVES OF *DESMODIUM GYRANS DC.*

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**ABSTRACT**

*Desmodium gyrans DC* is one of the medicinally valuable plants belonging to the family Fabaceae, commonly known as "*Thozhukanni*" in Tamil and *' Namaskari'* in Sanskrit. Traditionally leaves are used as antidote, cardiac-tonic and for wound healing. In the present study the ethanolic extract of *Desmodium gyrans* has been subjected to GC-MS analysis. Eighteen chemical constituents have been identified, The major chemical constituents are: 4,5-Dihydro-2-amino-4-(2,4-dichlorophenyl)-7-methyl-5-oxo- pyrano[3,2-c]pyran-3-carbonitrile (59.07%), Pentaborane (13.86%), Pentanedinitrile (6.63%) and 3-Chloro-1-butyne, (4.82%).

**Keywords:** *Desmodium gyrans,* GC-MS analysis, Phytochemical constituents.

## INTRODUCTION

*Desmodium gyrans* DC (Fam. *Fabaceae*) is commonly known as *'Thozhukanni'* in Tamil and *'Namaskari'* in Sanskrit. It is a very useful remedy in adhering the cut ends of flesh and healing it. This is also used in curing snake bite poisons. It is used as an antidote, cardiac-tonic and for wound healing. The leaves and roots of the plant are used for wound healing[1-3]. The related spices, some of them can be used as herbal medicines. For example, *Desmodium gangeticum* has been demonstrated to possess antioxidant, anti-nociceptive, anti-inflammatory [4, 5], anti-emetic [6], cardio-protective [7], and anti-ulcer effects [8]. Gangetin [9], salicylic acid, rutin [10], desmodin, gangetinin [11], chlorogenic acid and caffeic acid have been isolated from *Desmodium gangeticum*[12]. *Desmodium triflorum* has been reported to possess antioxidant[13], analgesic and anti-inflammatory activists [14].

In the present study the phytochemical constituents have been isolated from the leaves of *Desmodium gyrans* by GC-MS analysis.

## MATERIAL AND METHODS

### Plant materials

The plant was collected in the month of September from Trivandrum, Kerala, India and was identified by Dr. V. Chelladurai, Research Officer (Botany).Central Council of Research in Ayurveda and Siddha, Government Siddha Medical College, Palayamkottai, Tamilnadu, India. A voucher specimen (MSU/PHAR/HER-140) has been preserved in the Herbarium of the Department of Pharmaceutical Chemistry, Manonmaniam Sundaranar University, Tirunelveli - 627 012.

### Extraction of plant material

The leaves of *Desmodium gyrans DC* were dried under shade and powdered. The dried powder (500g) was successively extracted using petroleum ether (40-60°C), benzene, chloroform, ethanol and water by using Soxhlet apparatus. The last trace of the solvent was removed under reduced pressure by rotary evaporator. The dried crude ethanolic extract has been used for the GC-MS analysis.

## GC-MS ANALYSIS

### Preparation of extract

*2* µl of the ethanolic extract of *Desmodium gyrans* was employed for GC-MS analysis [15].

### Instruments and chromatographic conditions

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 (GC-MS) instrument employing the following conditions: Column Elite-5MS fused silica capillary column (30 × 0.25 mm ID ×0.25µm df, composed of 5% Diphenyl/95% Dimethyl poly siloxane), operating in electron impact mode at 70 eV; helium (99.999%) was used as carrier gas at a constant flow of 1ml/min and an injection volume of 0.5 EI 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/min, then 5°C/min to 280°C/min, ending with a 36 min isothermal at 280°C. Mass spectra were taken at 70 eV; a scan interval of 0-2 s and fragments from 45 to 550 Da.

### Identification of components

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

## RESULTS AND DISCUSSION

GC-MS Analysis

GC-MS chromatogram of the ethanolic extract of *Desmodium gyrans* (Figure 1) showed 18 peaks indicating the presence of eighteen phytochemical constituents. On comparison of the mass spectra of the constituents with the NIST library the eighteen phytoconstituents were characterized and identified (Table 1). The various phytochemicals which contributes to the medicinal activity of the plant are presented in (Tables 2).

**Figure.1: GC-MS Chromatogram of ethanolic extract of the leaves of *Desmodium gyrans* DC**

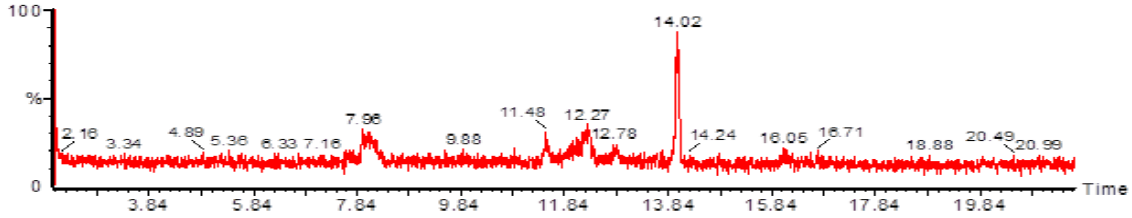


**Table 1: Phytochemical constituents identified in the ethanolic extract of the leaves of *Desmodium gyrans* by GC-MS**

| No. | RT | Name of the compound | Molecular formula | MW | Peak Area % |
|---|---|---|---|---|---|
| 1. | 3.34 | 2,5-Methano-2H-indeno[1,2-b]oxirene, 2,3,4,5,6,6a,7,7-octachloro-1a,1b,5,5a,6,6a-hexahydro-, (1aà,1bá,2à,5à,5aá,6á,6aà)- | $C_{10}H_4Cl_8O$ | 420 | 0.60 |
| 2. | 4.89 | Isoquinoline, 1-[(3,4-diethoxyphenyl)methyl]-6,7-diethoxy- | $C_{24}H_{29}NO_4$ | 395 | 1.21 |
| 3. | 5.36 | Sumatriptan | $C_{14}H_{21}N_3O_2S$ | 295 | 1.21 |
| 4. | 6.33 | 9-Azabicyclo(6,2,0)decan-10-one | $C_9H_{15}NO$ | 153 | 0.54 |
| 5. | 7.16 | 1,2,3,4-Tetrahydro-1-methyl-7-(4-nitrophenyl)oxazolo[2,3-f]purine-2,4-dione | $C_{14}H_9N_5O_5$ | 327 | 0.60 |
| **6.** | **7.96** | **Pentaborane** | **$B_5H_{11}$** | **66** | **13.86** |
| 7. | 9.88 | 1-Buten-3-yne | $C_4H_4$ | 52 | 0.60 |
| 8. | 10.89 | 1H-1,2,4-Triazole, 3-chloro-5-methyl- | $C_3H_4ClN_3$ | 117 | 1.81 |
| 9. | 11.48 | 3,4-Dimethyl-4-nitroso-2-pyrazolin-5-one | $C_5H_7N_3O_2$ | 141 | 2.41 |
| **10.** | **12.27** | **3-Chloro-1-butyne** | **$C_4H_5Cl$** | **88** | **4.82** |
| 11. | 12.78 | 1-Propanone, 2-(methylamino)-1-phenyl- | $C_{10}H_{13}NO$ | 163 | 1.81 |
| **12.** | **14.02** | **4,5-Dihydro-2-amino-4-(2,4-dichlorophenyl)-7-methyl-5-oxo-pyrano[3,2-c]pyran-3-carbonitrile** | **$C_{16}H_{10}Cl_2N_2O_3$** | **348** | **59.07** |
| 13. | 14.24 | Phosphorimidic bromide difluoride, (chlorofluorophosphinothioyl)- | $BrClF_3NP_2S$ | 279 | 1.81 |
| **14.** | **16.05** | **Pentanedinitrile** | **$C_5H_6N_2$** | **94** | **6.63** |
| 15. | 16.71 | 1,2,4,5-Tetrazine, 3,6-diethyl- | $C_6H_{10}N_4$ | 138 | 0.60 |
| 16. | 18.88 | 2-Pyridone, 3,5-diiodo-N-methyl- | $C_6H_5I_2NO$ | 361 | 1.21 |
| 17. | 20.49 | Dimethyl trans,trans-3-(4-cyano-buta-1,3-dienyl)isoxazole-4,5-dicarboxylate | $C_{12}H_{10}N_2O_5$ | 262 | 0.60 |
| 18. | 20.99 | DL-Alanine, N-benzoyl-N-(3-chloro-4-fluorophenyl)-, methyl ester [Mataven] | $C_{17}H_{15}ClFNO_3$ | 335 | 0.60 |

**Table 2: Activity of phyto-components identified in the ethanolic extract of the leaves of *Desmodium gyrans* by GC-MS**

| No. | RT | Name of the compound | Compound nature | **Activity |
|---|---|---|---|---|
| 1. | 3.34 | 2,5-Methano-2H-indeno[1,2-b]oxirene, 2,3,4,5,6,6a,7,7-octachloro-1a,1b,5,5a,6,6a-hexahydro-, (1aà,1bá,2à,5à,5aá,6á,6aà)- | Chloro compound | Antimicrobial |
| 2. | 4.89 | Isoquinoline, 1-[(3,4-diethoxyphenyl)methyl]-6,7-diethoxy- | Alkaloid | Antimicrobial, Antiinflammatory |
| 3. | 5.36 | Sumatriptan | Sulfur compound | Antimicrobial |
| 4. | 6.33 | 9-Azabicyclo(6,2,0)decan-10-one | Nitrogen compound | Antimicrobial |
| 5. | 7.16 | 1,2,3,4-Tetrahydro-1-methyl-7-(4-nitrophenyl)oxazolo[2,3-f]purine-2,4-dione | Nitrogen compound | Antimicrobial |
| **6.** | **7.96** | **Pentaborane** | **Borane compound** | **No activity reported** |
| 7. | 9.88 | 1-Buten-3-yne | Alkene compound | No activity reported |
| 8. | 10.89 | 1H-1,2,4-Triazole, 3-chloro-5-methyl- | Nitrogen compound | Antimicrobial |
| 9. | 11.48 | 3,4-Dimethyl-4-nitroso-2-pyrazolin-5-one | Alkaloid | Antimicrobial, Antiinflammatory |
| **10.** | **12.27** | **3-Chloro-1-butyne** | **Chloro compound** | **Antimicrobial** |
| 11. | 12.78 | 1-Propanone, 2-(methylamino)-1-phenyl- | Amino compound | Antimicrobial |
| **12.** | **14.02** | **4,5-Dihydro-2-amino-4-(2,4-dichlorophenyl)-7-methyl-5-oxo-Pyrano[3,2-c]pyran-3-carbonitrile** | **Amino compound** | **Antimicrobial** |
| 13. | 14.24 | Phosphorimidic bromide difluoride, (chlorofluorophosphinothioyl)- | Fluro compound | Antimicrobial |
| **14.** | **16.05** | **Pentanedinitrile** | **Nitrogen compound** | **Antimicrobial** |
| 15. | 16.71 | 1,2,4,5-Tetrazine, 3,6-diethyl- | Nitrogen compound | Antimicrobial |
| 16. | 18.88 | 2-Pyridone, 3,5-diiodo-N-methyl- | Iodo compound | Antimicrobial |
| 17. | 20.49 | Dimethyl trans,trans-3-(4-cyano-buta-1,3-dienyl)isoxazole-4,5-dicarboxylate | Nitrogen compound | No activity reported |
| 18. | 20.99 | DL-Alanine, N-benzoyl-N-(3-chloro-4-fluorophenyl)-, methyl ester [Mataven] | Amino acid and Fluro compound | Antimicrobial |

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

The four major phytochemical constituent's mass spectra are presented in Figure 2-Figure 5.They were identified as 4, 5-dihydro-2-amino-4-(2, 4-dichlorophenyl)-7- methyl-5 - oxo - pyrano [3, 2 - c] pyran - 3 - carbonitrile (59.07 %), Pentaborane (13.86%), Pentanedinitrile (6.63%) and 3-Chloro-1-butyne (4.82%) respectively.

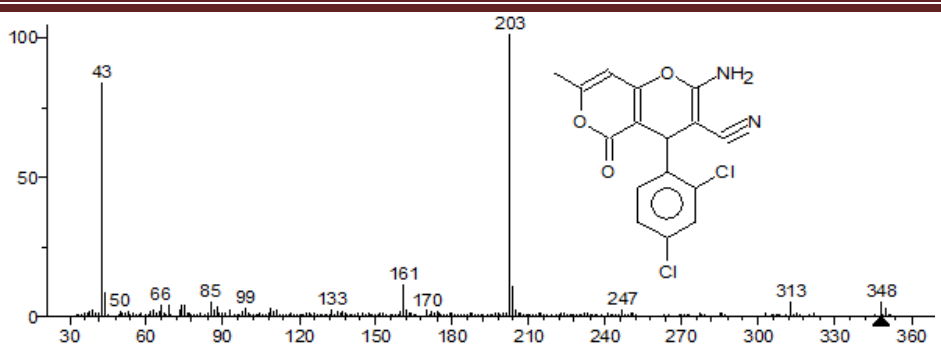


**Figure.2 : Mass spectrum of 4, 5-dihydro-2-amino-4-(2, 4-dichlorophenyl)-7-methyl-5-oxo-pyrano[3,2-c]pyran-3-carbonitrile *(RT:* 14.02*)***

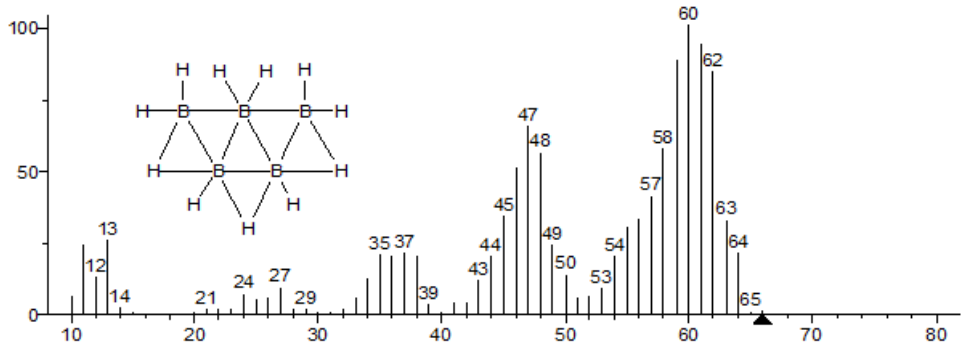


**Figure.3: Mass spectrum of Pentaborane *(RT:* 7.96*)***

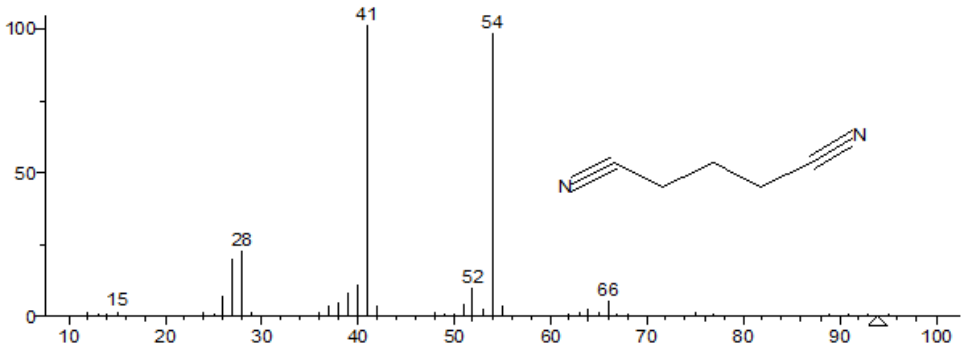


**Figure.4: Mass spectrum of Pentanedinitrile *(RT:* 16.05*)***

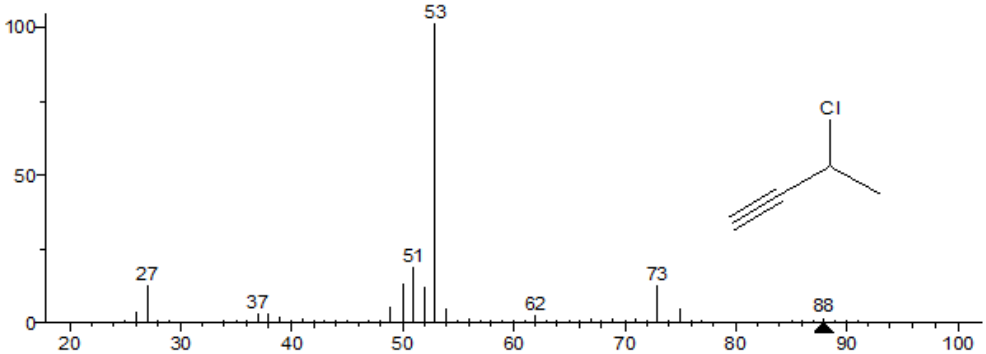


**Figure.5: Mass spectrum of 3-Chloro-1-butyne *(RT:* 12.27*)***

## CONCLUSION

In the present investigation, eighteen phyto-chemical constituents have been identified from the ethanolic extract of the leaves of *Desmodium gyrans* by Gas Chromatogram-Mass spectrometry (GC-MS) analysis. The presence of various bioactive compounds justifies the use of the leaves for wound healing by traditional practitioners. However isolation of the individual phytochemical constituent and subjecting it to biological activity will definitely give fruitful results. It could be concluded that *Desmodium gyrans* contains mainly antimicrobial compounds. So it can be recommended as a plant of phytopharmaceutical importance as a wound healing drug. However, further studies need to be undertaken to ascertain fully its bioactivity, toxicity profile, effect on the ecosystem and agricultural products.

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