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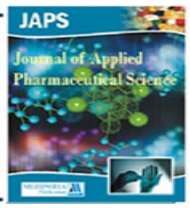

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Short Communication

GC-MS analysis of *Polygala rosmarinifolia* Wights & Arn

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ABSTRACT

This study was carried out to analyze the active constituents present in the whole plant of *Polygala rosmarinifolia*. Twelve compounds in ethanol extract were identified by Gas chromatography-Mass spectrometry (GC-MS) analysis. 1, 5–Anhydro-d-mannitol (73.35%) was the prevailing compound in ethanol extract, which is suggested to be an anticancer compound. This is the first report of identification of active constituents from whole plant of *Polygala rosmarinifolia*.

Keywords: *Polygala rosmarinifolia*, GC-MS, 1, 5–Anhydro-d-mannitol.

INTRODUCTION

Polygala is a branching type of herb native to the Central and Western United States. There are several varieties of *Polygala*. It earned its nick name “Seneca snake wood” in 1700’s, when Seneca Indians used it to treat snakebites in American settlers. *Polygala* was traditionally used by native Americans to treat snake bites (McGuffin et al, 1997) and as an expectorant to treat cough and bronchitis. In traditional Chinese medicine, *Polygala* is used for a variety of purposes including the promotion to sleep and calming the spirit. *Polygala* is considered as a powerful tonic herb (Teeguarden, 1998) that can help to develop the mind and aid in creative thinking. Taking into consideration of the medicinal importance of *Polygala rosmarinifolia,* the ethanol extract of the whole plant of *Polygala rosmarinifolia* were analyzed for the first time using GC-MS. This work will help to identify the compounds of therapeutic value.

MATERIALS AND METHODS

Collection of plant sample

Whole plant of *Polygala rosmarinifolia* was collected from Vadavalli, Coimbatore, Tamil Nadu.

Plant sample extraction

Leaves were cleaned, shade dried and pulverized to powder in a mechanical grinder. Required quantity of powder was weighed and transferred to stoppered flask, and treated with ethanol until the powder is fully immersed. The flask was shaken every hour for the first 6 hrs and then it was kept aside and again shaken after 24 hrs. This process was repeated for 3 days and then the extract was filtered. The extract was collected and evaporated to dryness by using vacuum distillation unit. The final residue thus obtained was then subjected to GC-MS analysis.

GC-MS analysis

GC-MS analysis of these extracts was carried out by following the method of Hema et al (2010). GC-MS analysis of these extracts were performed using a Perkin-Elmer GC claurus 500 system and Gas chromatograph interfaced to a Mass spectrometer (GC-MS) equipped with a Elite-I, fused silica capillary column(30m x 0.25 mm ID x 1 µ df), composed of 100% Dimethyl poly siloxane). For GC/MS detection, an electron ionization system with ionizing energy of 70 eV was used. Helium gas (99.999%) was used as the carrier gas at constant flow rate 1ml/min and an injection volume of 2 µl was employed split ratio of 10:1) injector temperature 250^{0}C; ion-source temperature 280^{0}C. The oven temperature was programmed from 110^{0}C (isothermal for 2 min) with an increase of 10^{0}C / min to 200^{0}C, then 5^{0}C/min to 280^{0}C, ending with a 9 min isothermal at 280^{0}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 minutes. The relative % 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.

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.

RESULTS AND DISCUSSION

Twelve compounds were identified in *Polygala rosmarinifolia* 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 Figure 1.

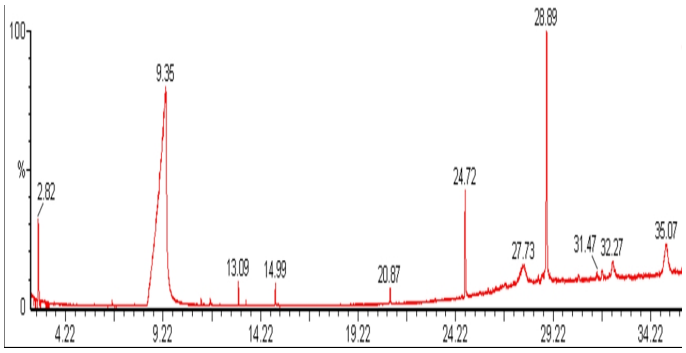

Fig. 1 GC-MS chromatogram of the ethanolic extract of the whole plant of *Polygala rosmarinifolia.*

The prevailing compounds were 1, 5–Anhydro-d-mannitol (73.35%), Benzene, 1, 2 – dimethoxy- 4 [(4-methyl phenyl) sulfonyl methyl] - (9.80%), d-mannitol, 1-decyl sulfonyl- (5.12%), 9-octadecenoic acid (Z) -, phenyl methyl ester (4.72%), squalene (3.22%) and propane, 1, 1, 3-triethoxy-(2.21%). Figures 2 and 3 shows the mass spectrum and structures of medicinally important phytochemical constituents of *Polygala rosmarinifolia* whole plant. Table 2 listed the various phytochemical constituents which contribute to the medicinal activity of the ethanolic extracts of *Polygala rosmarinifolia.*

1, 5–Anhydro-d-fructose is a metabolite of 1, 5–Anhydro-d-mannitol, is a useful anticarcinogenic agent as it inhibits the growth of the oral pathogen *Streptococcus mutans*. It also shows anti-inflammatory and anticancer effects (Fiskesund et al, 2010). 1, 5–Anhydro-d-mannitol is the major component found in the whole plant of *Polygala rosmarinifolia* which is being used for the pharmacological work.

This investigation has helped to identify the compounds present in the whole plant of *Polygala rosmarinifolia*. This is the first report of identification of active constituents from whole plant of *Polygala rosmarinifolia* by GC-MS. Evaluation of pharmacological activity in the ethanolic extract is in progress.

Table 1: Components detected in the whole plant ethanol extract of *Polygala rosmarinifolia.*

No.	RT	Name of the compound	Molecular Formula	MW	Peak Area %
1.	2.82	Propane, 1,1,3-triethoxy-	$C_9H_{20}O_3$	176	2.21
2.	9.35	1,5-Anhydro-d-mannitol	$C_6H_{12}O_5$	164	73.35
3.	11.17	Heptanoic acid, 2-ethyl-	$C_9H_{18}O_2$	158	0.09
4.	11.65	10-Dodecenol	$C_{12}H_{24}O$	184	0.13
5.	13.09	Dibutyl phthalate	$C_{16}H_{22}O_4$	278	0.40
6.	13.48	Nonanoic acid, ethyl ester	$C_{11}H_{22}O_2$	186	0.09
7.	14.99	Phytol	$C_{20}H_{40}O$	296	0.49
8.	20.87	Didodecyl phthalate	$C_{32}H_{54}O_4$	502	0.40
9.	24.72	Squalene	$C_{30}H_{50}$	410	3.22
10.	27.73	d-Mannitol, 1-decylsulfonyl-	$C_{16}H_{34}O_7S$	370	5.12
11.	28.89	Benzene, 1,2-dimethoxy-4-[[(4-methylphenyl)sulfonyl]methyl]-	$C_{16}H_{18}O_4S$	306	9.80
12.	35.07	9-Octadecenoic acid (Z)-, phenylmethyl ester	$C_{25}H_{40}O_2$	372	4.72

Table. 2: Activity of phyto-components identified in the ethanolic extracts of the whole plant of *Polygala rosmarinifolia* by GC-MS.

No.	RT	Name of the compound	Molecular Formula	Nature of compound	**Activity
1.	2.82	Propane, 1,1,3-triethoxy-	$C_9H_{20}O_3$	Ether compound	No Activity reported
2.	9.35	1,5-Anhydro-d-mannitol	$C_6H_{12}O_5$	Sugar alcohol	Anticancer compound
3.	11.17	Heptanoic acid, 2-ethyl-	$C_9H_{18}O_2$	Fatty acid compound	No Activity reported
4.	11.65	10-Dodecenol	$C_{12}H_{24}O$	Unsaturated alcohol	Antimicrobial
5.	13.09	Dibutyl phthalate	$C_{16}H_{22}O_4$	Plasticizer compound	Antimicrobial Anti fouling
6.	13.48	Nonanoic acid, ethyl ester	$C_{11}H_{22}O_2$	Fatty acid ester	No activity reported
7.	14.99	Phytol	$C_{20}H_{40}O$	Diterpene	Antimicrobial Antiinflammatory Anticancer Diuretic
8.	20.87	Didodecyl phthalate	$C_{32}H_{54}O_4$	Plasticizer compound	Antimicrobial Antifouling
9.	24.72	Squalene	$C_{30}H_{50}$	Triterpene	Antibacterial, Antioxidant, Antitumor, Cancer preventive, Immunostimulant, Chemo preventive, Lipoxygenase-inhibitor, Pesticide Diuretic
10.	27.73	d-Mannitol, 1-decylsulfonyl-	$C_{16}H_{34}O_7S$	Sulfur compound	Antimicrobial
11.	28.89	Benzene, 1,2-dimethoxy-4-[[(4-methylphenyl)sulfonyl]methyl]-	$C_{16}H_{18}O_4S$	Aromatic sulfur compound	Antimicrobial
12.	35.07	9-Octadecenoic acid (Z)-, phenylmethyl ester	$C_{25}H_{40}O_2$	Oleic acid ester	Antiinflammatory, Antiandrogenic Cancer preventive, Dermatitigenic Hypocholesterolemic, 5-Alpha reductase inhibitor, Anemiagenic Insectifuge, Flavor

****Source: Dr.Duke's:** Phytochemical and Ethnobotanical Databases.

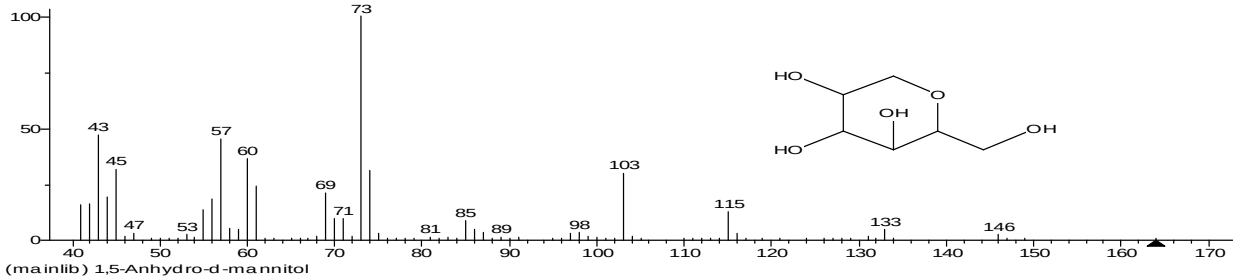

Fig. 2 Mass spectrum of 1,5-Anhydro-d-mannitol.

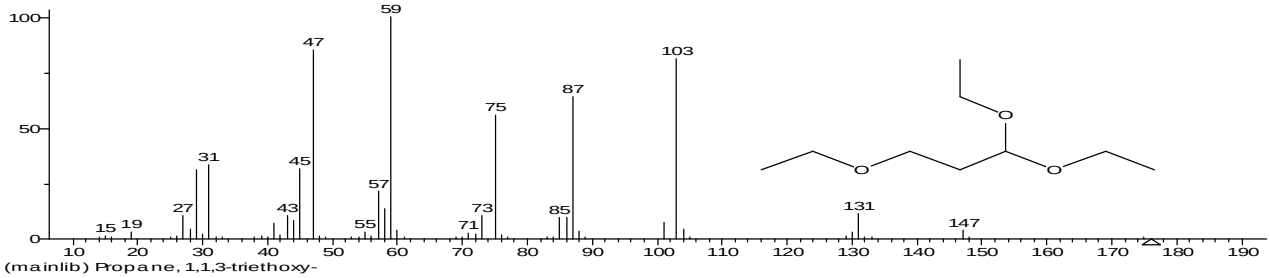

Fig. 3 Mass spectrum of Propane, 1, 1, 3-triethoxy.

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