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GC-MS analysis of hexane extract of Bolusanthus speciosus stem bark

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ABSTRACT

The investigation was carried out to determine the possible chemical components of the hexane extract of bolusanthus speciosus stem bark using GC-MS. Solvents like methanol, ethanol and acetone, which are polar, have been used before and their extracts exhaustively studied in terms of their biological activities. GC-MS analysis of the hexane extract led to identification of 13 compounds. The major compounds were found to be 1,3-dimethylbenzene (39.15%)(Retention time 7.259) and caryophyllene (16.25%) (Retention time 24.95).

Key Words: Bolusanthus speciosus, GC-MS analysis, Caryophyllene, Hexane extract.

INTRODUCTION

Bolusanthus speciosus commonly known as tree wisteria belongs to the Fabaceae family and it is a monolyptic species that has wide geographical distribution that extends from South Africa, Botswana, Zimbabwe and Zambia [1]. B.speciosus is one of the most beautiful trees in Southern Africa, it is 7-12 m tall with leaves having a smooth edged margin and slightly and irregularly scalloped, the flowers are a beautiful pea-shape, pale blue to violet in colour arranged in long dropping branches. The fruit is a flat narrow pod about 7-10 cm long with a light brown or straw colour and they may sometimes be grey or black due to age. The bark of older trees is blackish-brown and deeply longitudinally fissured [2-3]. Due to its beauty the tree is normally used as an ornament in gardens and parks, and the inner dried bark is used to treat abdominal pains, emetism and tuberculosis [3-5] and roots have been used as emetic [6]. Previously, other researchers using the ethyl acetate and methanolic extracts of the stem bark isolated 4,7,2'-trihydroxy-4'methoxyisoflavanol, two isoflavonoids 5,7,3',4'-tetrahydroxy-5'-(2-epoxy-3methylbutyl)isoflavanone [7]. Other isoflavonoids and alkaloids isolated from the plant were genestein, orobol, 3'methoxyorobol, pratensein, 3'O-methylpratensein and 3,5,7,3'-tetrahydroxy-4'-methoxyisoflavone [8]. The extracts of the chloroform and ethyl acetate of the root wood gave flavonoids 5,7,4'-trihydroxy-6-[1-hydroxy-2methylbuten-2-y]isoflavone, 7,2'-dihydroxy-4'-methoxyisoflav-3-ene and 6,6'-dihydroxy-4'-methoxyisoflav-3-ene [9]. The objective of this research was to explore the possible medicinal value of the hexane extract of the stem bark of bolusanthus speciosus by using GC-MS to determine the compounds present in the stem bark.

MATERIALS AND METHODS

Plant Material

The stem bark was collected from Mapoka village in the North East District of Botswana. The plant was collected by Betty Makhwaje from Botswana and its identity was confirmed by Mr David Phalatsi, North-West University Botanical department, South Africa.

Preparation of extract

40 g of finely ground stem bark of *B. speciosus* was soaked in 100 ml of hexane overnight and then filtered through whatmann filter paper No. 41.2g m of sodium sulphate was used to remove the sediments and traces of water in the filtrate. Before filtering, both the filter paper and sodium sulphate were wetted with hexane. The filtrate was concentrated by removing hexane using rotar vapor at 68.7° C until the volume was 1 ml. The extract contained non-polar phytocomponents.

GC-MS Analysis

The model of the GC-MS used for mass spectral identification of the methanol, acetone and hexane extracts was an Agilent 6890 interfaced to a 5973 mass selective detector. The capillary column (30 m x 0.25 mm x 0.25 μ m film thickness) was HP-5MS. The oven temperature was initially maintained at 50°C for 5 minutes and then programmed to 250°C at 5°C min⁻¹. The carrier gas used was helium (99.999%), at a flow rate of 1 ml/ min, and injection volume of 1 μ l was employed (split ratio of 10:1). The electron-impact ionization of the mass spectrometry was operated at an electron energy of 70 eV. Mass spectra were taken at 70 eV, a scan interval of 0.5 seconds and fragments from 40 to 450 Da. Total GC running time was 45 min.

Identification of phytocompounds

Interpretation of the mass spectrum of GC-MS was conducted using the database of National Institute Standard and Technology (NIST) which consists of more than 62,000 patterns. The spectrum of the unknown component was compared with the spectrum of the known component inherent in the NIST library. The name, molecular weight and structure of the components of the test materials were ascertained.



Figure 1: GC-MS spectrum of hexane extract of Bolusanthus speciosus

RESULTS AND DISCUSSION

The study on active principles of the hexane extract of stem bark of *Bolusanthus speciosus* by GC-MS showed the presence of thirteen compounds. The major and minor compounds with their retention times (TR), molecular formulae, molecular weights (MW) and concentrations (%) are presented in Table 1 and Figure 1. The major constituents were found to be 1,3-dimethylbenzene (39.15%), caryophyllene (16.25%), para-Xylene (9.12%), 2-Naphthalenemethanol, decahydro-.alpha.,.alpha.,4a-trimethyl-8-methylene-, [2R-(2.alpha.,4a.alpha.,8a.beta.] (8.46%) and ethylbenzene (8.25%). Caryophyllene is a sesquiterpene. Sesquiterpenes are used as anaesthetics,

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antifungal, antiseptic and antibacterial. In other studies, trans-caryophyllene has showed potential in blockading of electromechanical excitation-contraction coupling and minor inhibitory effect on pharmacomechanical coupling [10]. The results therefore point to the fact that hexane extract also have some biological activities like the polar extracts.

No.	Compound	Structure of the	R _t	Molecular mass	Molecular formula	Percentage area	MS fragment
1	Acetic acid, butyl ester		5.558	117	C ₆ H ₁₂ O ₂	5.66	43, 56, , 61, 73, 87, 101, 117
2	Ethylbenzene	\bigcirc	6.992	106	C ₈ H ₁₀	8.25	40, 51, 65, 77, 91, 106
3	1,3-dimethylbenzene	CH3 CH3	7.259	106	C ₈ H ₁₀	39.15	51, 65, 77, 91, 106
4	p-Xylene	H ₃ C-CH ₃	7.959	106	C ₈ H ₁₀	9.12	51, 65, 77, 91, 106
5	1-ethyl-3-methylbenzene	H ₃ C	10.259	120	C ₉ H ₁₂	1.62	51, 65, 77, 91, 105, 120
6	1,2,3-trimethylbenzene	H ₃ C H ₃ C	11.392	120	C ₉ H ₁₂	0.88	51, 65, 77, 91, 105, 120
7	1-methyl-3-(1-methylethyl)-benzene	H ₃ C CH ₃ NCO H ₃ C NCO	14.492	134	$C_{10}H_{14}$	0.22	51, 65, 77, 91, 119, 134
8	Azulene		17.893	128	$C_{10}H_{8}$	0.14	51, 63, 77, 102, 128
9	α-cubebene		23.659	204	C ₁₅ H ₂₄	0.10	43, 65, 77, 91, 105, 119, 161, 189, 204

Table 1: Phytocomponents identified	in the	e Bolusanthus	speciosus

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10	Caryophyllene	E C F C F	24.959	204	C ₁₅ H ₂₄	16.25	41, 55, 79, 93, 105, 120, 133, 161, 189, 204
11	α-caryophylene	$\langle \rangle$	25.926	204	C ₁₅ H ₂₄	0.98	41, 53, 67, 80, 93, 107, 121, 147, 161, 189, 204
12	1,2,3,4-tetrahydro-1,6-dimethyl-4-(1- methylethyl)-, (1S-cis)-naphthalene		27.626	202	C ₁₅ H ₂₂	4.32	41, 53, 77, 91, 105, 129, 144, 159, 187, 202
13	2-Naphthalenemethanol, decahydro- .alpha.,.alpha.,4a-trimethyl-8- methylene-, [2R- (2.alpha.,4a.alpha.,8a.beta.]		31.093	222	C ₁₅ H ₂₆ O	8.46	43, 59, 67, 79, 93, 108, 122, 149, 164, 189, 222

CONCLUSION

In this study thirteen chemical constituents from the hexane extract of stem bark of *Bolusanthus speciosus* by GC-MS method were identified. The presence of caryophyllene and other bioactive compounds justifies the usage of the hexane extract of the plant for treatment of certain ailments.

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