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Phytochemical screening and GC MS analysis of methanolic extract of Abelmoschus moschatus

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ABSTRACT

The study was designed to evaluate the phytoconstituents present in the methanolic extract of aerial parts of Abelmoschus moschatus. The qualitative phytochemical screening of different extracts of aerial parts revealed the presence of some bioactive compounds. GC – MS analysis was performed using Shimadzu Gas chromatography-mass spectroscopy (Model Number: QP2010S) instrument. GC-MS detection of phytoconstituents was done by computer evaluation of mass spectra of samples through National Institute Standard and Technology (NIST II) and WILEY 8 library. GC – MS analysis detected the presence of 14 compounds. GC – MS profile of the methanolic extract revealed the presence of megastigmatrienone, phytol, loliolide, farnesyl acetate, methyl linoleates, gamma-sitosterol, cis, cis, cis-7,10,13-Hexadecatrienal, thymine, pyranone, coumarin, 2 – methoxy 4 – vinyl phenol, guanosine, chinasaure and 3- cyclopentyl propionic acid 2 dimethyl aminoethyl ester. The current study suggests that methanolic extracts of aerial parts of Abelmoschus moschatus contain phytoconstituents with antioxidant and cytoprotective activity. The study results will pave a way for the production of therapeutic agents which can be used for the treatment of various diseases.

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INTRODUCTION

The genus Abelmoschus comprise of about 15 species of flowering plants and belongs to Malvaceae family. It is an aromatic and medicinal oil yielding plant commonly grown in some parts of our country. (Pawar and Vyawahare, 2018). Abelmoschus moschatus has lots of medicinal properties and is called as Kattukasthuri or musk mallow in different areas. The plant is widely used in folk medicine for its therapeutic properties. Almost every part of musk mallow has medicinal properties. The plant has a long record of use in conventional health care systems. Many races think this plant as a remedy for various diseases.

In India, roots, leaves, and seeds of this plant are used for therapeutic purpose (Dwivedi *et al.*, 2017). Mucilage prepared from root and leaves of the plant is advocated in sexually transmitted bacterial infections. The poultice of leaves and roots is used in cystitis, fever, headache, rheumatism, and for varicose veins and boils.

In Egypt, seeds are munched to alleviate gastric disorders. Different types of ayurvedic formulations from seeds are used for nervous weakness, hysteria

and other neurological conditions.

Traditionally seeds have considerable role in the therapy of progressive loss of neurological functions. Seeds rubbed to a paste with milk are used to cure itch (De Padua *et al.*, 1999).

Figure 1: Abelmoschus moschatus

Flower infusion is contraceptive. The mucilaginous seeds are emollient and demulcent. (Dwivedi, 2017). Topical application of the seed oil relieves abdominal cramps, circulatory insufficiency and joint pain. Ambrette oil has insecticidal and sexual stimulant properties (Dwivedi and Argal, 2015; Purohit and Vyas, 2004).

Although the plant has enormous use in traditional medicine, most of the biological activities are not scientifically validated. Abelmoschus moschatus is a perennial plant. Stems are solid and is about 30cm tall. Leaves have variable size and shape and some are sagittate. Leaf margins are lobed. Leaf apex is obtuse. Flowers have a diameter of 4 – 5cm. They are solitary. The flowers have 5 petals with colours ranging from white, pale yellow to dark pink Figure 1. They last for only one day and their flowering depends on the timing of the wet season. Seeds are held in hairy tough, papery capsules. The seeds have a sweet, flowery, heavy fragrance similar to that of musk (Harborne, 1998)

Synonyms

Abelmoschus ficulneus, Hibiscus abelmoschus, Hibiscus moschatus, Abelmoschus sagittifolius.

Plant Profile

Botanical Name: Abelmoschus moschatus subsp. tuberosus

Family: Malvaceae

Vernacular Names

English: Musk mallow, Ambrette

Malayalam: Kasthurivenda

Tamil: Varttilaikasturi

MATERIALS AND METHODS

Collection of the plant

The plant Abelmoschus moschatus Figure 1 was collected from Pala, Kottayam district, Kerala. The plant was authenticated at Botanical Survey of India, and deposited in the herbarium with voucher No. BSI/SRC/5/23/2020/Tech/65

Chemicals and Reagents

All the chemicals and reagents were procured from certified suppliers and of analytical reagent grade.

Preparation of the extracts

The plant extracts were prepared following the procedure of Gopalasatheeskumar (2018) by Soxhlet extraction method. The aerial parts of the plant were dried under shade and was ground to a powder using an electrical blender. Extraction was carried out by continuous hot percolation method by using the following solvents in order i.e., Petroleum ether, Chloroform, Acetone and Methanol. The extracts were then concentrated using a rotary evaporator and kept at 4^{o}C until used. These extracts were used for phytochemical screening.

Phytochemical screening

Phytochemical analysis of crude extracts of aerial parts of Abelmoschus moschatus was carried out as per standard procedures (Evans and Trease, 2009; Sofowora, 1993).

GC MS analysis

GC – MS analysis was done on the methanolic extract of aerial parts of Abelmoschus moschatus. Shimadzu GC – MS (Model Number: QP2010S) instrument with GC – MS solutions software was used for analysis. The oven temperature is maintained at 280^{o}C at a rate of 5^{o}c/min. Elite - 5MS column of 30m length,0.25mmID and 0.25micrometer thickness was used.

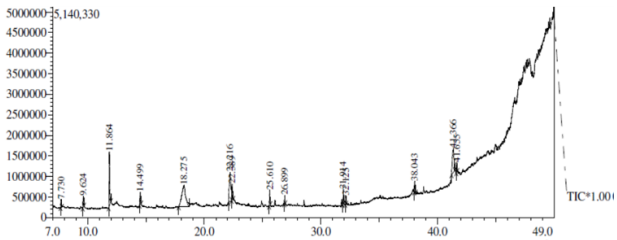

Figure 2: GC – MS chromatogram

Detection of the phytoconstituents present in the methanolic extract of Abelmoschus moschatus was based on the comparison of mass spectra of samples through National Institute Standard and Technology (NIST II) and WILEY 8 library.

Table 1: Phytochemical screening of aerial parts of Abelmoschus moschatus

SI No	Plant Constituent	PEE	CE	AE	ME
1	Alkaloids	-	-	-	-
2	Glycosides	-	-	-	-
3	Steroids and triterpenoids	+	-	+	+
4	Flavanoids	-	+	-	+
5	Carbohydrates	+	+	+	+
6	Phenolic compounds and tannins	-	-	-	-
7	Proteins	–	–	–	–
8	Saponins	-	-	-	-
9	Fixed oils and fats	-	-	-	-

– Absent, + Present, PEE – Petroleum Ether Extract, CE– Chloroform Extract, AE – Acetone Extract, ME – Methanol Extract

Table 2: GC MS report

Peak	Retention Time	Area	Area %	Name	Base m/z
1	7.730	763484	1.98	Thymine	126.05
2	9.624	839703	2.17	Pyranone	144.05
3	11.864	5130420	13.29	Coumarin	120.10
4	14.499	1013571	2.62	2-methoxy-4-vinylphenol	150.05
5	18.275	12582915	32.59	Guanosine	57.05
6	22.216	6736006	17.44	Chinasaure	60.00
7	22.389	1419711	3.68	Megastigmatrienone 4	133.10
8	25.610	1048037	2.71	(-)-Loliolide	111.05
9	26.899	432928	1.12	Farnesyl acetate 3	69.05
10	31.914	970061	2.51	Methyl linoleates	79.05
11	32.125	584546	1.51	Phytol	71.05
12	38.043	812354	2.10	3-Cyclopentylpropionic acid, 2-dimethylaminoethyl ester	58.10
13	41.366	5493377	14.23	Gamma -Sitosterol	55.05
14	41.655	786258	2.04	Cis, cis, cis-7, 10, 13-Hexadecatrienal	79.05

Parameters such as comparison of peaks and retention time, computer matching and the characteristic fragmentation patterns of the mass spectra were used for characterizing the phytoconstituents. GC – MS profile of the compounds identified is given in Figure 2.

RESULTS AND DISCUSSION

The phytoconstituents present in the extracts were qualitatively analyzed using chemical tests. Phytochemical analysis of the four extracts of Abelmoschus moschatus showed the presence of steroids, Triterpenoids, Flavonoids and carbohydrates Table 1.

The methanolic extract contains maximum number of phytoconstituents and GC – MS technique was used to identify the constituents in this extract. The results of GC – MS analysis is shown in Table 2.

Peak area and retention time were used for the identification of compounds. GC- MS analysis of methanolic extract of aerial parts of abelmoschus moschatus revealed the presence of terpenes (Megastigmatrienone, Phytol). Megastigmatrienones are nor – isoprenoid compounds derived from carotenoids and are the main compounds found in tobacco. (Anthony *et al.*, 2009) Phytol is an acyclic diterpene alcohol. Phytol has been reported to have antioxidant, anti-inflammatory and antitumor effects. Hydroxyl group present in phytol confers antioxidant property to the molecule (Guimarães *et al.*, 2010). Loliolide is a monoterpene lactone and possess significant antioxidant and cell protective effects against the cellular damage produced by H_2O_2. (Yang *et al.*, 2011). Gamma sitosterol is an important plant

sterol. Gamma-sitosterol exhibited hypoglycemic effect on streptozocin induced diabetes in rats. Gamma sitosterol is reported to increase insulin secretion and inhibit glucogenesis. Literature survey reveals that gamma sitosterol has a role in the activation of components involved in extrinsic apoptotic pathway in human lung and breast adenocarcinoma cells. (Sundarraj *et al.*, 2012). Farnesyl acetate and methyl linoleate are fatty acid esters and possess activity against gram -ve bacteria, moulds and dermatophytes. (Pauli, 2001)

CONCLUSIONS

The presence of various bioactive constituents like terpenes, monoterpene lactone, steroids and carotenoid derivatives in Abelmoschus moschatus validates the use of this medicinal herb for a number of diseases by traditional healers. However, isolation of individual phytochemical constituents and screening for their bioactivity will give hopeful results. Therefore, Abelmoschus moschatus can be considered as a plant of considerable phytopharmaceutical importance.

Conflict of Interest

The authors declare that they have no conflict of interest for this study.

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