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Investigation of Phytochemical Constituents of Butea monosperma's Leaf Base Using GC-MS.

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ABSTRACT: Butea monosperma, also referred to as Palash, is widely known as the Flame of the Forest and belongs to the Fabaceae family. Throughout the course of human evolution, the significance of natural products in medicine and health has been substantial. Butea monosperma is generally utilized in Ayurveda, Unani and Homeopathic medicine, and has emerged as a focal point in modern medicine. Phytochemicals are natural compounds that can be obtained through both primary and secondary metabolic pathways. They are synthesized naturally in all parts of the plant structure, including the bark, stem, root, flower, fruits, seeds, leaves and more. Butea monosperma demonstrates promising anti-inflammatory and analgesic effects, which are attributed to its wide range of Butea monosperma, such as flavonoids, steroids, glucosidesand aromatic compounds. This study aims to explore the phytochemical compounds present in Butea monosperma.

KEYWORDS: Butea monosperma, Bioactive compounds, medicine.

I. INTRODUCTION

Butea monospermaconsist of different medicinal propertieswhich belongs to the Fabaceae family. Its leaves, seeds, flowers, stem are eachconsidered remedial for various ailments (Manivasagan et al., 2019).The plant exhibits a range of properties including antidiabetic, antifertility, antistress, antihelmintic, anticancer,anti-inflammatory, antidiarrheal and antibacterial. The therapeutic factors Butea monosperma correspond to its leaves, seeds, flowers, stem. It's characterized as a standing tree, reaching heights of 12 to 15 measures, with irregular branches. It has rough surface and ash-multi-coloured, while the flower surface is velvet like. The leaves are trifoliate, with petioles measuring 10 to 15 centimeters in lengthand the stipules are direct and lanceolate (Sharma & Deshwal, 2011). Butea monosperma (BM), commonly referred to as Palas in traditional medicine, is a medicinal plant. The flowers are known to exhibit a variety of therapeutic properties. Research has demonstrated their antioxidantand anti-inflammatory capabilities. In addition to the flowers, the leaves and stems of theplant have undergone numerous studies to explore their medicinal benefits. The leaves have primarily shown anti-inflammatory and anti-diabetic effects, while the stem has been found to possess significant hepatoprotective and anti-diarrheal properties (Vaidya & Pandita, 2017). Seeds possess anti-implantation and anti-ovulatory characteristics.

The bark indicate anti-microbial properties, demonstrates anti-fungal activity, and is utilized in the treatment of tumors, bleeding piles, and ulcers. The medicinal attributes of this plant are documented in ancient Indian texts, with nearly every part of the plant—including roots, stem, bark, leaves, flowers, fruits, seeds, and gum—being employed in Ayurvedic and Unani medicine (Bagul et al., 2021).

II. MATERIAL AND METHOD:

1. Collection and identification of plant:

The fresh and healthy leaf base of Butea monosperma plant were gathered from the Satpuda forest located in the Buldhana district of Maharashtra, India. The identification of the collected plant material was conducted using standard floras (V.N. Naik et al., 1998). The leaf base were shade-dried and subsequently ground using a mixer to produce a fine powder for further analysis.

2. Extraction

A total of 10 grams of Butea monosperma leaf powder was extracted using methanol solvents in a Soxhlet apparatus for a duration of 24 hours, after which it was evaporated to dryness. For the phytochemical analysis, the dried extract was re-dissolved in the same solvent, and these samples

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were subsequently prepared for GC-MS analysis.

3. GC – MS Analysis

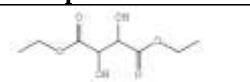
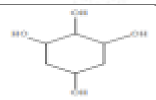
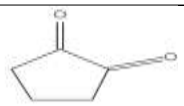
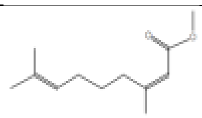
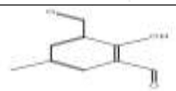
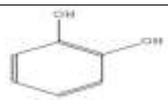
The phytochemical compound was examined using Gas Chromatography – Mass Spectrometry. The methanol-dried extract was dissolved in 1 ml of the respective solvent and 1 ml of this solution was utilized for GC – MS analysis. The GC-MS analysis was performed with a Shimadzu GCMS-TQ8050, featuring a column that is 30 meters in length, with an inner diameter of 0.25 mm and a thickness of 0.25 mm. Helium gas served as the carrier gas. The oven temperature range was set in between 50 °C to 260 °C. The sample was insert in a 50:1 ratio in split mode. The identification of the compounds was achieved by comparing the spectral data of the unknown sample compound with the spectra of known compounds available in spectral libraries (NIST).

III. RESULTS AND DISCUSSION

The identification of phytochemical compounds was conducted using Gas Chromatography - Mass Spectroscopy, utilizing the NIST Library database. The mass spectrum of the unidentified phytochemical compound was compared against authentic standards of known compounds recorded in the computerized NIST Library.

The Figure-1 shows the result of GC-MS chromatogram of Butea monosperma leaf base methanol extract andrepresented the presence of nine phytochemical compounds. There were 9 peaks observed and out of that 3 peaks those were greater than 1% in area mentioned in the Table 1 that comprises Name of Compound, Structure of Compound, Retention Time , Peak area(%), Molecular Formula, Molecular weight. The Peak 28.148 expressed the highest area percent 90.68among them and identified as D-Fructose, 3-O-methyl. The peak 25.747 identified as 1,2,3,5-Cyclohexanetetrol,(1.alpha.,2.beta.,3.alpha.,5.beta.) which is expressed second most compound 5.67 percent area followed by 12.191 and 15.308 peaks shows serially 1.62, 0.95 percent area and the phytochemical compounds investigated 1-Butanol, 3-methyl-, formate and Catechol respectively.

Table 1: Phytochemical compounds identified in methanol extract.

Sr. No.	Name of compound	Structure of Compound	Retention Time	Area in %	Molecular Formula	Molecular Weight
1	(+)-Diethyl L-tartrate		15.633	0.48	C8H14O6	206
2	1,2,3,5-Cyclohexanetetrol, (1.alpha.,2.beta.,3.alpha.,5.beta.)		25.747	5.67	C6H12O4	145
3	1,2-Cyclopentanedione		7.421	0.12	C5H6O2	98
4	1-Butanol, 3-methyl-, formate		12.191	1.62	C6H12O2	116
5	2,7-Nonadienoic acid, 3,8-dimethyl-, methyl ester, (Z)		22.958	0.16	C12H20O2	196
6	2-Hydroxy-5-methylisophthalaldehyde		30.488	0.11	C9H8O3	164
7	Catechol		15.308	0.95	C6H6O2	110

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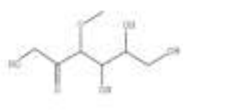
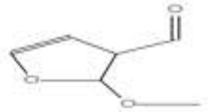
8	D-Fructose, 3-O-methyl		28.148	90.68	C7H14O6	194
9	Furan-3-carboxaldehyde, 2-methoxy-2,3-dihydro		12.531	0.21	C6H8O3	128

CONCLUSION:

The methanol extract of leaf baseidentified the important secondary metabolites. The Butea monosperma leaves shows the important medicinal properties which can be utilized in various research fields in future. The substrate for the production of β-carbolinesin food is D-fructose, 3-O-methyl (Herraiz & Vera, 2021).

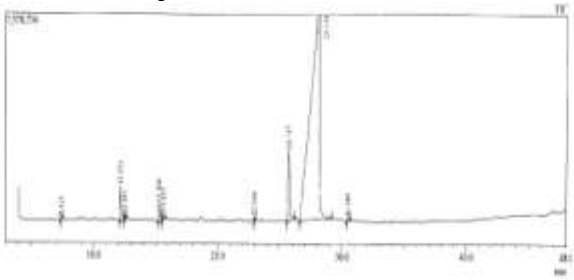


Figure-1: GC-MS chromatogram of Butea monosperma leafbase methanol extract

1, 2-Cyclopentanedione is an antioxidant-active chemical (Keerthana & Chitra, 2020). Formate might be a conclusiveoxidation substrate in mitochondria (Igamberdiev et al., 1999). The starting molecule for the manufacture of FALC/HALC, which are molecules that resemble fulvic/humic acid, is catechol(Kiprop et al., 2013).Furan-3-carboxaldehyde is a common chemical in food processing and is used as a flavouring as well as aroma in foods, such as ice cream (Mu et al., 2023). Butea monosperma Methanol extract of leaves exhibited potent and concentration dependant free radical scavenging activity (Kapse et al., 2020).

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