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GC-MS SCREENING OF ACTIVE BIOMOLECULES FROM *ERYTHRINA VARIEGATA* L.

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Abstract: Plant-derived natural substances have been utilized to treat different health conditions in individuals. Phytochemicals are metabolites produced by plants as secondary compounds. They are naturally occurring chemical compounds in plants that are biologically active. In the current study, the phytochemical components found in butanolic extracts of the leaves, stems, and roots of *Erythrina variegata* were determined through Gas Chromatography and Mass Spectroscopy (GC-MS) analysis to evaluate their biological activity. GC-MS analysis of butanolic extracts from leaves, stems, and roots identified seven, five, and seven bioactive compounds, respectively. The key prevalent bioactive compounds found in the butanolic extracts of the leaf, stem, and root include Butane, 1,1-dibutoxy with peak areas of 54.89 %, 66.62 %, and 64.59 %, respectively, while the butanolic extract of the root shows the highest peak area for Butanoic acid, butyl ester at 10. 14%. The research reveals the existence of different phytochemicals in the butanolic extracts of the leaf, stem, and root of *E. variegata,* demonstrating antimicrobial, antibacterial, antifungal, and other therapeutic attributes.

Keywords: bioactive compound, butanolic extract., *Erythrina variegata,* GC-MS analysis, phytochemicals.

Introduction

Since the dawn of human history, plants have been used for a variety of purposes. The application of medicinal plants has included the extraction of active ingredients [SÜNTAR, 2020]. Investigating new drugs from medicinal plants includes evaluating plant extracts for novel compounds and subsequently performing biological activity tests [ATANASOV & al. 2015]. Suspected novel molecules or bioactive compounds are subsequently isolated and purified for the determination of molecular structure and additional pharmacological or toxicological investigations [SHASTHREE & al. 2009]. Parts of plants of interest, including roots, stems, bark, leaves, or fruits, undergo treatment with a suitable solvent to isolate the phytochemicals [BITWELL & al. 2023].

Gas chromatography-Mass spectrometry is a combined analytical technique utilized for examining the bioactive substances in plants employed in cosmetics, pharmaceuticals, drugs, the food sector, and applications in environmental and forensic fields [GOMATHI & al. 2015]. It is a method of separation where a mobile phase containing a mixture is compelled to move while in contact with a selectively adsorptive stationary phase, known as chromatography [HANSEN, 2015]. It holds a crucial position in the phytochemical examination of medicinal plants that have biologically active substances [SAXENA & al. 2013].

The species *Erythrina variegata* (Fabaceae) has shown that alkaloids and flavonoids are key components. Various sections of *Erythrina variegata* have been utilized in traditional

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medicine for their effects as a nervine sedative, febrifuge, anti-asthmatic, and antiepileptic [KUMAR & al. 2010]. The application of GC-MS in studying *Erythrina variegata* provides numerous benefits, including excellent sensitivity, specificity, and the ability to detect minute quantities of substances in intricate mixtures [MUTHUKRISHNAN & al. 2016].

In this research, GC-MS screening was conducted to identify bioactive molecules found in different plant parts, emphasizing their potential bioactivity.

Material and methods

Fresh leaves, stems, and roots of *Erythrina variegata* were collected and carefully rinsed under running tap water to eliminate any soil residue. They can be dried in the shade prior to being ground into a powder at ambient temperature. A total of 10 grams of powdered leaf, stem, and root were obtained, and the mixture was placed in 50 mL of butanol, maintaining a speed of 130 revolutions per minute in an orbital shaker for 48 hours. The GC-MS analysis was conducted using crude extracts from the leaf, stem, and root with butanol.

Method of analysis

The GC-MS examination of a butanolic extract from *Erythrina variegata* was performed utilizing an Agilent 8890 GC device. Using an injector with a capacity of 1 liter and a milligram per minute ratio of 1:1, helium gas was utilized as a gaseous carrier at a temperature of 75 °C. The oven temperature was adjusted to 350 °C. Typically, the GC-MS analysis duration for butanolic extracts from the leaf, stem, and root of *Erythrina variegata* is 41.5 minutes. The bioactive compounds were recognized by their retention time, the MS fragment ions produced, and the proportion of these bioactive compounds was assessed from the overall peak area. The phytochemicals were identified by matching their MS spectrum patterns with the standard mass spectra found in the National Institute of Standards and Technology (NIST) Mass Spectra Database.

Results and discussions

The GC-MS analysis of three different explants (leaf, stem and root) of *Erythrina variegata* confirmed the presence of bioactive compounds.

GC-MS analysis of leaf butanoic extract

A total of approximately six bioactive compounds were discovered in the butanolic extract of *Erythrina variegata* leaves (Table 1). They are Octadecane, 6-methyl-, Oxirane, octyl, Butane, 1,1- dibutoxy-, Neophytadiene, 3-Methylene- 7,11-dimethyl- 1-dodecene and Phytol. Of the seven compounds (Figure 1), the one with the shortest retention time of 6.130 min was Octadecane 6-methyl-($C_{19}H_{40}$) [DAS & al. 2024], which had a peak area of 10.33%, whereas the compound with the longest retention time of 30.354 min and a peak area of 12.44% was phytol ($C_{20}H_{40}$) [SUVARCHALA & al. 2022]. Phytol, a type of diterpene, is commonly utilized for its antimicrobial, antioxidant, antitumor, anticancer, antiarthritic, immunostimulatory, antidiabetic, chemo preventive, pesticidal, and diuretic effects and possesses sunscreen attributes [WILLIE & al. 2021].

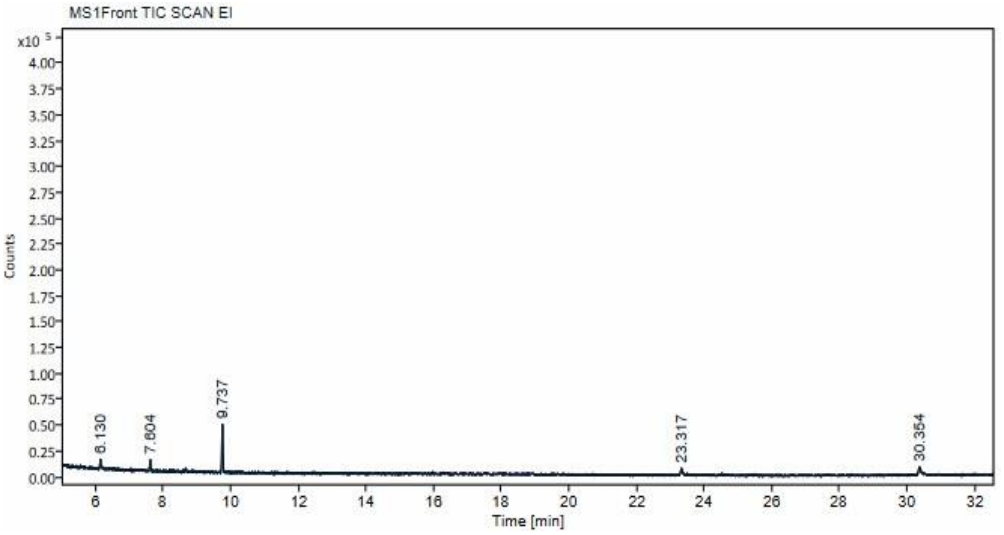

Figure 1. GC-MS Chromatogram of leaf butanolic extract of *Erythrina variegata*

Table 1. Bioactive compounds of *Erythrina variegata* leaf butanolic extract using GC-MS analysis

S. No.	Compound name	Chemical formula	Mwt (g/mol)	RT (min)	Area (%)
1.	Octadecane, 6- methyl-	$C_{19}H_{40}$	268.52	6.130	10.33
2.	Oxirane, octyl	$C_{10}H_{20}O$	156.26	6.131	10.33
3.	Butane, 1,1- dibutoxy-	$C_{12}H_{26}O_2$	202.33	9.737	54.89
4.	Neophytadiene	$C_{20}H_{38}$	278.5	23.317	8.56
5.	3-Methylene- 7,11-dimethyl- 1-dodecene	$C_{15}H_{28}$	208.3	23.316	8.44
6.	Phytol	$C_{20}H_{40}O$	296.5	30.354	12.44

GC-MS analysis of stem butanolic extract

The butanolic stem extracts of *E. variegata* disclosed a total of four phytochemical compounds determined by their molecular weight, rentention time, and peak area percentage. They are Hexanal, 2-ethyl, Butanoic acid, butyl ester, 1,1-Diisobutoxy- isobutene and Butane, 1,1- dibutoxy (Figure 2). Among them, Butane, 1,1- dibutoxy [$C_{12}H_{26}O_2$] [KHAN & JAVAID, 2020] exhibited the longest retention time at 9.738 minutes with a peak area of 66.62%, whereas Hexanal,2-ethyl [$C_8H_{18}O$] [HUANG & al. 2024] displayed the shortest retention time of 3.632 and a peak area of 10.35% (Table 2).

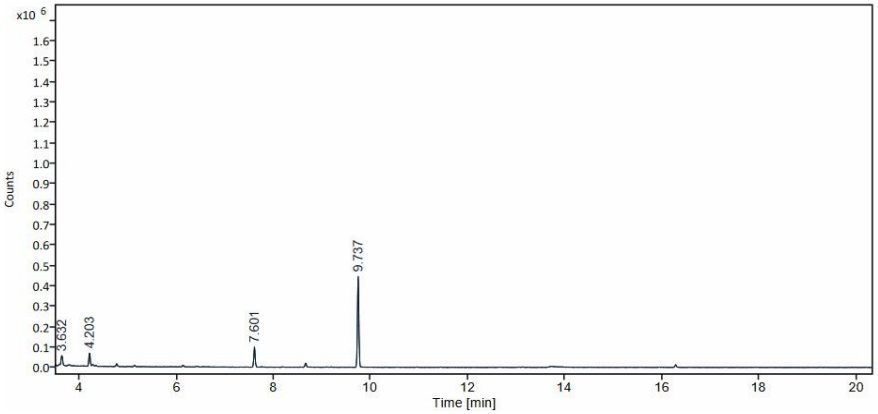

Figure 2. GC-MS Chromatogram of stem butanolic extract of *Erythrina variegata*

Table 2. Bioactive compounds *of Erythrina variegata* stem butanolic extract using GC-MS analysis

S. No.	Compound name	Chemical formula	Mwt (g/mol)	RT (min)	Area (%)
1.	Hexanal, 2- ethyl	$C_8H_{16}O$	130.23	3.632	10.35
2.	Butanoic acid, butyl ester	$C_8H_{16}O_2$	144.21	4.203	9.10
3.	1,1-Diisobutoxy- isobutene	$C_{12}H_{26}O_2$	202.38	7.601	13.93
4.	Butane, 1,1- dibutoxy	$C_{12}H_{26}O_2$	202.33	9.737	66.62

GC-MS analysis of root butanolic extract

Seven bioactive components were identified in the butanolic extracts derived from the root of the *Erythrina variegata* plant (Table 3). The initial compound, hexane, 2-ethyl ($C_8H_{18}O$), exhibited the shortest retention time of 3.632 and a peak area of 10.35%. The last compound recorded was butane, 1,1-dibutoxy ($C_{12}H_{26}O_2$), showing the longest retention time of 9.747 and a peak area of 64.59% (Figure 3).

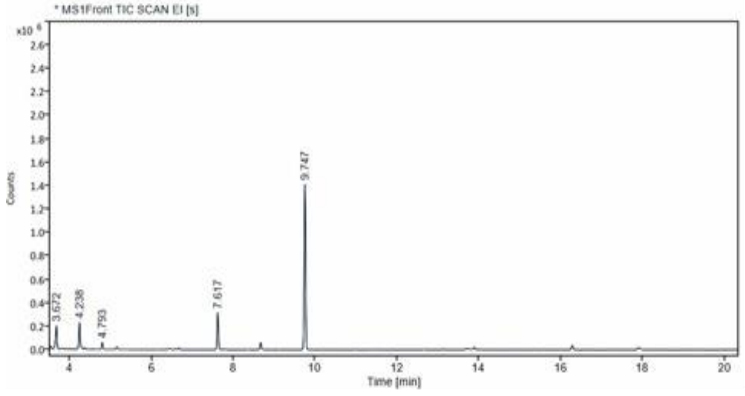

Figure 3. GC-MS Chromatogram of root butanolic extract of *Erythrina variegata*

Table 3. Bioactive compound of *Erythrina variegata* root butanolic extract using GC-MS analysis

S. No.	Compound name	Chemical formula	Mwt (g/mol)	RT (min)	Area (%)
1.	Hexanal, 2-ethyl	$C_8H_{16}O$	130.23	3.672	9.16
2.	Butanoic acid, butyl ester	$C_8H_{16}O_2$	144.21	4.203	10.14
3.	1- Hexanol, 2-ethyl	$C_{12}H_{18}O_2$	130.227	4.793	2.35
4.	2,2- Dimethylpropionic acid, decyl ester	$C_{15}H_{30}O_2$	242.22	4.794	2.35
5.	1- Butoxy-1-isobutoxy-butane	$C_{12}H_{26}O_2$	202.33	7.617	13.76
6.	1-1 Dilscobutoxy- isobutene 1-1	$C_{12}H_{26}O_2$	202.33	7.619	13.76
7.	Butane, 1-1- dibutoxy	$C_{12}H_{26}O$	202.33	9.747	64.59

Conclusions

The present study contributed to the discovery of seventeen bioactive compounds from the butanolic extracts of various plant parts of *E. variegata*. GC-MS analysis of butanolic extracts from the leaf, stem, and root was conducted to examine phytochemical compounds in *E. variegata*. Many substances demonstrate therapeutic benefits. Among the six compounds identified in leaf butanolic extract, the one that exhibited the shortest retention time was Octadecane 6-methyl-($C_{19}H_{40}$) at 6.130 min, showing a peak area of 10.33%. On the other hand, the compound exhibiting the longest retention time was phytol ($C_{20}H_{40}O$), noted at 30.354 min, showing a peak area of 12.44%, recognized for its antinociceptive, antioxidant, and anti-inflammatory effects. All these chemical substances offer potential advantages for various ailments and are valuable in the search for new drugs.

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