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International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Oxalis Latifolia a Comparative Analysis Using GC-MS and HPLC

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DOI : https://doi.org/10.55248/gengpi.6.0125.0202

ABSTRACT:

This study used High-Performance Liquid Chromatography (HPLC) and Gas Chromatography-Mass Spectrometry (GC-MS) to identify and measure the bioactive chemicals found in *Oxalis latifolia*. A standardised extraction process was used to obtain the extracts from fresh plant samples. Compounds were detected by GC-MS analysis; HPLC analysis was used to quantify the main, revealing notable levels of ascorbic acid and quercetin. This study's data on *Oxalis latifolia's* chemical contents from both analytical methods demonstrated how crucial it is to use cutting-edge analytical techniques to investigate the pharmacological potential of lesser-known plant species.

Key word: *Oxalis latifolia*, GC-MS, HPLC, Quercetin

1. INTRODUCTION

Medicinal plants have long been utilized to address human health concerns due to the therapeutic properties of the compounds they contain (Nostro et al., 2000; Tanaka, 2002). Traditional medicine plays an important role in Indian cultures, with practices varying across regions and communities (Makhubu, 2006). India’s rich biodiversity and vast traditional knowledge, including systems such as Ayurveda and Siddha, have attracted global interest for the development of new drugs to treat a variety of diseases (Cohen, 1991). The country’s diverse topography and agro-climatic conditions support the growth of over 20,000 plant species, with about 2,500 of these known for their medicinal properties (Choudhari, 1980).

Plant-based medicines are often perceived as having fewer or no side effects compared to synthetic antibiotics. *Oxalis latifolia*, commonly known as garden pink-sorrell or broadleaf woodsorrel, is a flowering plant in the Oxalidaceae family. Native to Mexico and parts of Central and South America, this species does not face significant issues with its nomenclature, though the botanical authority is sometimes listed as 'H.B. &K.' rather than 'Kunth'. Oxalis species, including *O. latifolia*, are notable for producing scaly bulbs, a rare trait among dicotyledons. The bulb measures 1-2 cm in diameter and consists of two main types of scales (Jackson, 1960).

2. MATERIAL AND METHODS

2.1 GC-MS analysis

These extracts were subjected to GC-MS analysis using the methodology described by Hema et al. (2010). A mass spectrometer (GC-MS) fitted with an Elite-1 fused silica capillary column (30 m 0.25 mm ID 1 µm df) made of 100% dimethyl polysiloxane was connected to the chromatograph. An electron ionisation device with an ionising energy of 70 eV was employed for GC-MS detection. The carrier gas was helium gas (99.999%) with a fixed flow rate of 1 ml/min and an injection volume of 2 µL (split ratio of 10:1). 280°C was the ion-source temperature while 250°C was the injector temperature. The oven temperature was set to begin at 110°C (isothermal for two minutes), climb by 10°C/min to 200°C, then increase by 5°C/min to 280°C, and finally end with an isothermal hold at 280°C for nine minutes. With a mass range of 45 to 450 Da and a scan interval of 0.5 seconds, mass spectra were obtained at 70 eV. The GC ran for 36 minutes in total. By comparing each component's average peak area to the total area, the relative percentage of each component was determined. Turbo Mass was the program that handled the chromatograms and mass spectra.

2.2 HPLC analysis

A modular Shimadzu LC-10 system comprised of a LC-10AD pump, a CTO-10A column oven, a SPD-10A UV-DAD detector, a CBM-10A interface and a LC-10 Workstation was utilized. A LC-18 column (250 mm x 4 mm i.d. x 5 mm) from Supelco (Bellefonte, USA) was employed, at 30o C. Separations were done in the isocratic mode, using acetonitrile: water (40:60; v/v) at a flow rate of 1 mL min-1; with an injection volume (“loop”) of 20 µL; UV detection was at 274 nm.

3 RESULTS

3.1 GCMS Analysis of methanol extract of Oxalis latifolia

The GC-MS analysis of the methanol extract of *Oxalis latifolia* identified several compounds (Table 1). By comparing the mass spectra of these compounds with the NIST library, Quercetin and organic components such as Secocholesta and stigmast were identified. The major constituents included Hexadecanoic acid, Octadecatrienoic acid, and 2, 6-dihexadecanoate, along with several minor compounds. The GC-MS chromatogram displayed distinct peaks corresponding to the separation of these components. The identified compounds from the methanol extract of *Oxalis latifolia* leaves are believed to exhibit biological activity, and further research using HPLC analysis could confirm their potential.

3.2 HPLC ANALYSIS

The HPLC analysis of the crude extract from *O. latifolia* leaves revealed numerous peaks within the retention time range of 0 to 50 minutes, with a total of 8 peaks observed beyond 50 minutes (Table 2). The separation process focused primarily on flavonoid components, such as quercetin, and other organic compounds, based on the GC-MS findings. Quercetin was identified in the extract by comparing its retention time with that of the standard (Table 3). The peak assignment was validated through the injection of the standard.

Table. 1 GCMS analysis of Methanol extract of *Oxalis latifolia*

Library Search Results

SI	RSI	Compound Name	Probability	Molecular Formula	Molecular Weight	Area %
752	766	QUERCETIN 7,3',4'-TRIMETHOXY	30.15	C18H16O7	344	0.58
732	804	9,10-Secocholesta-5,7,10(19)-triene-1,3-diol, 25-[(trimethylsilyl)oxy]-, (3à,5Z,7E)- (CAS)	13.73	C30H52O3Si	488	0.58
732	804	9,10-Secocholesta-5,7,10(19)-triene-1,3-diol, 25-[(trimethylsilyl)oxy]-, (3à,5Z,7E)-	13.73	C30H52O3Si	488	0.58
729	746	DI-(9-OCTADECENOYL)-GLYCEROL	12.13	C39H72O5	620	0.58
726	760	1-Monolinoleoylglycerol trimethylsilyl ether	10.72	C27H54O4Si2	498	0.58
726	760	9,12-Octadecadienoic acid (Z,Z)-, 2,3-bis[(trimethylsilyl)oxy]propyl ester (CAS)	10.72	C27H54O4Si2	498	0.58
720	746	9-Octadecenoic acid (Z)- (CAS)	8.42	C18H34O2	282	0.58
707	735	Oxiraneoctanoic acid, 3-octyl-, cis- (CAS)	5.44	C18H34O3	298	0.58
689	706	4H-1-Benzopyran-4-one, 2-(3,4-dimethoxyphenyl)-5,7-dihydroxy- (CAS)	2.80	C17H14O6	314	0.58
673	752	METHYL 7-ETHYL-10-HYDROXY-11-HYDROXY(18O)-3,11-DIMETHYL-2,6-TRIDECADIENOATE	1.61	C18H32O4	312	0.58

Image.2 Component structure

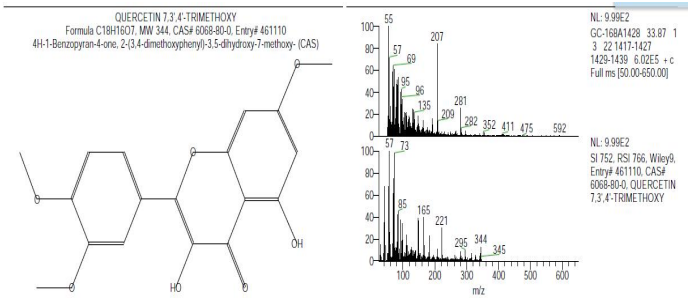
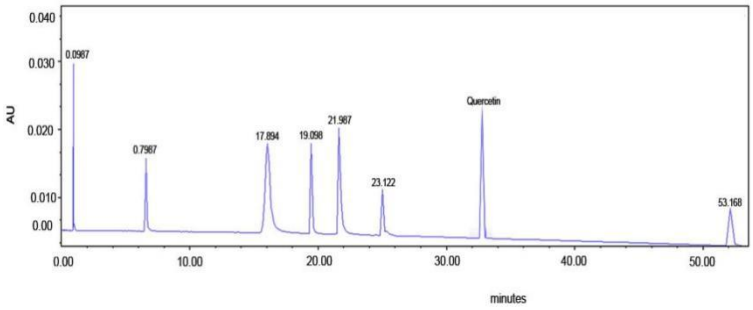


Table.3 HPLC analysis of *Oxalis latifolia*



4. CONCLUSION

GC-MS and HPLC analyses facilitated the identification of several bioactive compounds in the methanol extract of *O. latifolia*, with quercetin being confirmed through HPLC by matching its retention time with the standard. These findings align with previous research emphasizing the importance of bioactive compounds. A total of 50 compounds from various chemical classes were identified, with 34 being reported for the first time in Oxalis species.

The chemotaxonomic relationship among the studied species was assessed, revealing that O. latifolia can be distinguished from other species by the absence of compounds like maritimetin-6-O-hexoside, 5-methoxysalicylic acid, and others. Notably, *O. latifolia* is characterized by the presence of salicylic acid, citramalate, and quercetin 3-hexoside (Draz et al., 2022).

Implications and Future Directions Additionally, the identification of quercetin and other bioactive compounds paved the way for investigating their potential synergistic effects and improving extraction methods to enhance antimicrobial activity. The application of advanced techniques such as GC-MS and HPLC in phytochemical analysis supported the growing potential of plant-based antimicrobials as a viable, sustainable alternative to synthetic drugs.

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