



Received on 02 July 2025; received in revised form, 29 July 2025; accepted, 30 July 2025; published 31 July 2025

DETERMINATION OF TOTAL FLAVONOID CONTENT, TOTAL PHENOLIC CONTENT, GC-MS AND HPTLC ANALYSIS OF HYDRO ALCOHOLIC EXTRACT OF DRIED LEAVES OF *PORTULACA GRANDIFLORA* HOOK

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Keywords:

Portulaca grandiflora, GC-MS, UV-Vis Spectrophotometer, HPTLC, Rutin, Gallic acid

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ABSTRACT: To perform phytochemical screening, estimate total phenolics and total flavonoid content of hydro alcoholic extract of dried leaves of *Portulaca grandiflora* Hook. The shade- dried leaves of *P. grandiflora* (100 g) were extracted exhaustively by Soxhlet with hydro- alcohol. The conc. hydro-alcoholic extract were further studied to quantitative determination, GC-MS and HPTLC to identify and characterize the chemical compound present in the crude extract. The phenolic content present in hydro-alcoholic leaf extract was found to be 1.57µg/ml (µg of Gallic acid/mg of extract) and flavonoid content was found to be 2.73µg/ml (µg of Rutin/mg of extract). Phytochemical analysis of hydroalcoholic extract showed presence of major classes of phytochemicals. High performance – thin layer chromatography results revealed the mobile phase of ethyl acetate: formic acid: glacial acetic acid: water (10:0.5:0.5:1.3), the fluorescent band under (254 nm and 366 nm) at R_f 0.21 was identified, and the marker chemical rutin was measured. Gas chromatography – mass spectroscopy results showed the presence of 27 phytoconstituents including phenolic acids, ketones, flavonoids, carbohydrates, and hydrocarbons. The results of this study support the traditional usage of *P. grandiflora*, a plant that contains a number of known and unidentified bioactive chemicals that may be utilised as a powerful source against a number of ailments.

INTRODUCTION: For thousands of years, nature has served as a source for therapeutic medicines, and many modern medications have been created from natural sources. About half of all drugs on the market today have a natural origin. Plants are all potential sources of natural medicines ¹. Natural products are often a starting point for drug discovery because they have already been optimized by evolution for biological activity and can be modified to improve their effectiveness and reduce their side effects.

Plant-derived substances have become an area of great interest in recent years, owing to their versatile applications in various fields. Many natural compounds found in plants have been shown to have medicinal properties, such as anti-inflammatory, antioxidant, and anticancer effects. Plant extracts and essential oils are also used in aromatherapy and alternative medicine practices ².

The versatility and potential applications of plant-derived substances make them an important area of research and development, with the potential to benefit various industries and improve human health and well-being. The WHO states that the pharmacognostic investigations are the initial step in the identification and purification of herbal medications and are crucial for any phyto-pharmaceutical products used in standard formulation ³.



The majority of crude herbs used in traditional medicine come from wild sources, and they are often collected and assessed for quality parameters before use. These quality parameters can include the presence of various phytochemicals, such as alkaloids, flavonoids, and terpenoids, which are responsible for the medicinal properties of the plant. The phytochemical analysis is an important step in evaluating the quality of crude herbs, as it can help to ensure that the plant material is of the appropriate species and that it has been collected and processed properly. Standardization of natural products can be a complex task, particularly when dealing with whole plant extracts, due to their heterogeneous composition⁴.

Developing a standardized method for analyzing the active ingredients in natural products can be challenging. To overcome this challenge, a variety of analytical methods have been developed to identify and quantify specific phytochemicals or groups of phytochemicals in natural products. *Portulaca grandiflora* Hook. Commonly known as 'Moss rose' is an erect, succulent flowering plant belonging to the family Portulacaceae which had a wide variety of therapeutic properties. The plant has played an important role in tribal and rural medicine. Chemical constituents of *Portulaca grandiflora* such as Quercetin, Kaempferin, and Myricetin, and Caffeic acid, β - sitosterol⁵. The leaves extract have a huge amount of alkaloids, flavonoids, saponins, tannins, and phenolic substances. The entire plant of *Portulaca grandiflora* Hook. is used as a depurative (helps in purification) and also used in the prevention of hepatitis. To treat snake and insect bites, burns, scalds, and dermatitis, fresh juice from the leaves and stems is applied topically as a lotion. It is also reported for its efficacy on hepatitis. Asthma, cough, urine discharges, inflammations, and ulcers can all be treated with it. Antioxidant and anti-diabetic effects of *P. grandiflora* have been reported⁶⁻⁷. The present investigation includes determination of total phenolic and total flavonoid content, and we can identify the phyto-constituents in the hydro-alcoholic leaf extract of *P. grandiflora* Hook using GC-MS and HPTLC.

MATERIAL AND METHODS: The leaves of the *P. grandiflora* Hook. were collected from the medicinal herbal garden of Maharshi Dayanand

University, Rohtak, India. Ethanol was procured from Loba chemie Pvt. Ltd, India. Rutin and gallic acid standard were obtained from CDH, New Delhi.

Preparation of Hydro Alcoholic Extract: The leaves of *P. grandiflora* were authenticated by Dr. S.S Yadav, Associate Professor in the Department of Botany, Maharshi Dayanand University, Rohtak. Fresh leaves of *P. grandiflora* were washed with tap water and clean to remove the dust particles. Then leaves were shade dried for two weeks and coarse powdered by a mortar pestle. The powder was separately defatted with n-hexane (40 -600C) by Soxhlet apparatus for 5 hrs. The defatted leaves were dried and extracted with hydro alcohol (50:50 v/v) using the Soxhlet apparatus for 8 h until the solvent appears transparent. Then extract which remains in the flask is concentrated in water bath and stored at room temperature in desiccators for further use⁸.

Quantitative Analysis of Plant Extract Determination of Total Phenolic Content: Spectrophotometric analysis was used to determine the total phenolic content using a modified Folin-Ciocalteu (FC) calorimetric method.

Preparation of Standard Stock Solution: The standard (gallic acid) curve ranges of 0.0–100 μg of gallic acid/ml were obtained by diluting the reagents with the solvent. Then the test tubes, 1ml of 10% (v/v) FC reagent were added. After thoroughly mixing and incubating for 5 minutes, 0.8 ml of Na_2CO_3 at 7.5% (w/v) was added. After that, Deionized water was added in an appropriate amount to make the volume up to 10 ml. The combination was then incubated for an additional hour at room temperature in the dark. After that, a UV/Vis spectrophotometer (Shimadzu UV-3600 Plus spectrophotometer) was used to measure absorbance against a blank at 760nm. A calibration curve as Concentration vs. Absorbance was constructed⁸⁻⁹.

Sample Preparation: 1 mg/ml Sample was produced in methanol and UV spectroscopy was used to compare the absorbance to a blank solution. The quantity of gallic acid in the sample extract was determined by utilizing a standard curve for calculation purposes.

Determination of Total Flavonoid Content: A calorimetric assay using aluminium chloride was used to assess the flavonoid content¹⁰.

Preparation of Standard Solution: 1 ml of sodium nitrite (5%) was added to test tubes. After 10 min. 0.32 ml of a 10% AlCl₃ solution was added. 2.1 ml of 1M NaOH was added to the solution after 5 minutes. The mixture was immediately diluted by adding a volume make up of distilled water and properly mixed. At 510 nm, the absorbance was measured in comparison to the blank. For the calibration curve, rutin was employed as the standard¹¹⁻¹².

Sample Preparation: 1 mg/ml Sample was prepared in methanol and determine the absorbance with a blank solution by using UV-Spectroscopy. Using a standard curve, the quantity of rutin in the sample extract was determined through calculation. The concentration of hydro-alcoholic leaf extract was measured in mg rutin equivalents per gram of sample (mg/g).

Gas Chromatography-Mass Spectroscopy (GC-MS) Analysis: The GC-MS analysis of the hydro-alcoholic leaf extract of *P. grandiflora* was conducted at the Central University of Punjab (CPU) located in Bathinda, India. The GC analysis was performed using a GC-MS instrument (Model: QP 2010 series, Shimadzu, Tokyo, Japan) equipped with a TR-5MS fused silica capillary column (5% diphenyl/95% dimethyl polysiloxane) and an AOC-20i+ autosampler. The column had dimensions of 0.25 mm in diameter, 30 mm in length, and a film thickness of 0.25 µm. For injection, a sample volume of 2 µl was utilized with the injector. Helium gas served as the carrier gas during the analysis. The MS instrument operated at an ionization energy of 70 eV. The column flow rate was set to 1.21 ml/min, while the total flow rate was 16.3 ml/min. The flow control was adjusted to achieve a linear velocity of 39.9 cm/sec. The initial oven temperature was 50°C, with a ramp scan interval of 0.50 seconds, reaching 250°C and holding for 5 minutes. Subsequently, the temperature was increased to 260°C using a split ratio of 10:0. The total running time for the GC-MS analysis was 65 minutes. To determine the relative percentage of each component, peak area normalization was employed, expressing the

percentage of each component based on its peak area.

Sample Preparation: 150 mg of hydroalcoholic extract of dried leaves of *P. grandiflora* was dissolved in 10 ml of methanol. Subsequently, the extract was passed through Whatman filter paper No. 42 to obtain a filtrate that was free from impurities, resulting in a clear extract. GC-MS analysis of this hydro- alcoholic dried leaves extract was further carried out for pesticide residue test¹³⁻¹⁵.

High Performance Thin Layer Chromatography (HPTLC) Analysis: The hydro-alcoholic leaf extract of *P. grandiflora* underwent HPTLC analysis utilizing Win cat software. The analysis was conducted using an HPTLC instrument consisting of a LINOMAT 5 applicator and CAMAG 3 scanner for characterization purposes. The selected solvent system for developing the chromatogram was composed of ethyl acetate: formic acid: glacial acetic acid: water: 10:0.5:0.5:1.3.

Preparation of Standard Rutin Solution: In order to create the standard solution of rutin, 10 mg of rutin was dissolved in 10 ml of methanol, resulting in a concentration of 1000 µg/ml. From this initial standard solution, a working standard of 100µg/ml was prepared by diluting a suitable volume with methanol. Furthermore, various concentrations ranging from 10µg/ml to 100 µg/ml were prepared by diluting the standard solution with methanol.

Preparation of Sample Solution: Exactly 100 mg of the hydro-alcoholic dried leaf extract of *P. grandiflora* was precisely measured and transferred to a 100 ml volumetric flask. Initially, the extract was dissolved in 80 ml of methanol and subjected to sonication for a duration of 10 minutes. The contents of the flask were then filtered through Whatman No. 1 paper sourced from Merck in Mumbai, India. In order to obtain a stock solution with a concentration of 1.0 mg/ml of the hydroalcoholic extract, the final volume of the solution was adjusted to 100 ml using methanol.

Chromatographic Conditions and Instrumentation: HPTLC analysis was conducted on aluminium-backed plates measuring 10 cm x 10 cm, coated with silica gel 60F254 sourced from

Merck in Mumbai, India. Using a Camag Linomat V sample applicator equipped with a 100 μ l Hamilton syringe, bands of both the rutin standard solution and the sample solution were applied onto the plates. The bands were 6.0 mm wide, spaced 30.0 mm apart, and positioned 10.0 mm from the bottom edge of the chromatographic plate. Next, the plates underwent ascending development at room temperature ($28 \pm 2^\circ\text{C}$) utilizing a mobile phase composed of ethyl acetate: formic acid: glacialacetic acid: water (10:0.5:0.5: 1.3, v/v/v). This development process took place within a Camag glass twin-trough chamber, which had been pre-saturated with the mobile phase for 20 minutes. Following the completion of the development process, the plate underwent a drying period of 5 minutes. Subsequently, a scan at 254 nm was performed using a Camag TLC Scanner, which was equipped with WINCAT software and utilized a deuterium lamp for detection. The chromatographic plate was analyzed using a densitometer in reflectance mode, specifically at a wavelength of 254 nm. Several tracks were scanned, and the recorded area corresponded to the spot of rutin in both the sample and standard preparations. The percentage of rutin present in the sample was subsequently calculated based on the observed areas¹⁶⁻¹⁹.

RESULTS:

Determination of Total Phenolic Content: The standard acid is shown in phenolic content hydroalcoholic grandiflora was $1.57\mu\text{g/ml}$ (μg of extract). curve of Gallic **Fig. 1**. The total of dried leaf extract of *P. grandiflora* found to be of Gallic acid/mg.

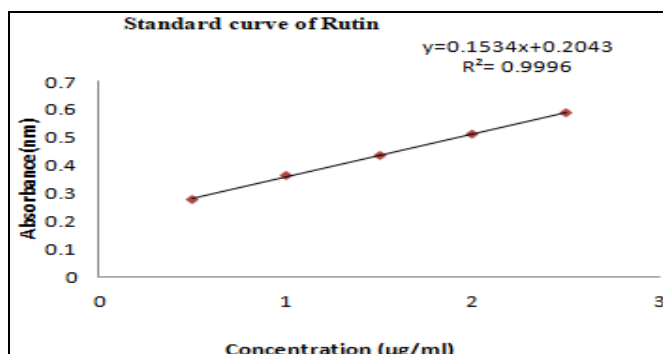


FIG. 1: CALIBRATION CURVE OF GALLIC ACID IN METHANOL

Total the standard shown in Determination of flavonoid content Curve of Rutin is **Fig. 2**. The total flavonoid content of dried leaves of hydroalcoholic extract of *P. grandiflora* was found to be $2.73\mu\text{g/ml}$ (μg of Rutin/mg of extract).

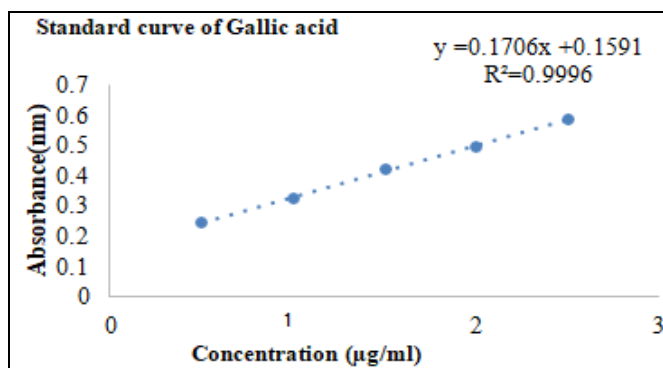


FIG. 2: CALIBRATION CURVE OF RUTIN IN METHANOL

GC-MS Analysis: GC-MS chromatogram **Fig. 3** of the hydroalcoholic leaf extract of *P. grandiflora* Hook. Confirms the presence of 27 compounds indicated by the presence of 27 different peaks having their specific respective retention time. By using a gas chromatogram, the observed relative concentrations of different chemicals were determined.

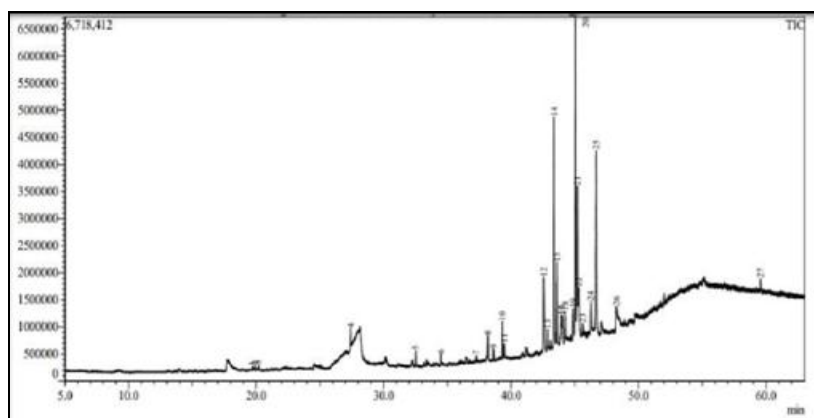


FIG. 3: GC-MS CHROMATOGRAM OF THE HYDRO ALCOHOLIC LEAF EXTRACT OF *P. GRANDIFLORA* HOOK.

Pesticide residues may negatively affect the food chain, so any herbal medicinal items should not contain more pesticide residues than is suitable for human consumption. No organ phosphorus &

organo chlorides were found, showing the absence of pesticidal residues in test plant extract. Phyto-constituents present in leaf extract of *P. grandiflora* Hook. are given in **Table 1**.

TABLE 1: GC-MS PROFILE OF *P. GRANDIFLORA*

Sr. no.	Retention time (RT)	Name of the Compound	Molecular Formula (MF)	Molecular Weight (MW)	%of Peak Area
1.	19.694	1-Tridecane	C13H26	182	0.24
2.	19.919	Tetradecane	C14H30	198	0.22
3.	20.181	(1R,2S,4S,5R,7R)-5-isopropyl-1-l-1-methyl-3,8-dioxatricyclo[5.1.0.02,4]octane	C10H16O2	168	0.32
4.	27.420	Sulfurousacid,cyclomethylheptylester	C14H28O3S	276	1.07
5.	32.523	Hexadecanoicacid,methylester	C17H34O2	270	0.87
6.	34.501	Dodecanoicacid,11-hydroxy-,methylester	C13H24O3	228	0.99
7.	37.271	9,12,15-Octadecatrienoicacid,ethylester, (Z,Z,Z)	C20H34O2	306	0.32
8.	38.184	14-Deoxyandrographolide	C20H30O4	334	1.38
9.	38.641	((3S,aR,6R,8As)-7,7-Dimethyl-8-methyleneoctahydro-1H-3a,6- methanoazulen-3yl)methanol	C15H24O	220	0.62
10.	39.313	14-Hydroxycaryophyllene	C15H24O	220	2.14
11.	39.476	(-)-Isolongifolol,acetate	C17H28O2	264	0.57
12.	42.557	Testosterone-nitrate	C19H27NO4	333	6.60
13.	42.867	Tricyclo[5.2.2.0(1,6)]undecan-3-ol, 2methylene-6,8,8-trimethyl	C15H24O	220	1.26
14.	43.373	2-Pentenoic acid, 5-(decahydro-5,5,8a- trimethyl-2-methylene-1naphthalenyl)-3- methyl	C20H32O2	304	15.43
15.	43.603	Testosterone-nitrate	C19H27NO4	333	5.38
16.	43.946	2-Pentenoic acid, 5-(decahydro-5, 5,8a- trimethyl-2-methylene-1-naphthalenyl)-3- methyl-, [1S-[1.alpha.(E),4a.beta.,8a.alpha.]]	C20H32O2	304	1.08
17.	44.023	Cortisone	C21H34O5	366	1.80
18.	44.244	2-Cyclopentene-1-butanal, .gamma.,.gamma.,2,3-tetramethyl	C13H22O	194	1.59
19.	44.877	1,1,6-trimethyl-3-methylene-2-(3,6,9,13- tetramethyl-6-ethenye-10,14-dimethylene- pentadec-4-enyl)cyclohexane	C33H56	452	2.43
20.	45.052	1-Naphthalenepropanol,.alpha.- ethenyldecahydro-2-hydroxy-.alpha.,2,5,5,8a-pentamethyl-, [1R-[1.alpha.(R*),2.beta.,4a.beta.,8a.alpha.]]	C20H36O2	308	21.16
21.	45.200	1-Heptatriacotanol	C37H76O	536	11.38
22.	45.309	Antiquorin	C20H28O3	316	3.39
23.	45.614	1-Heptadec-1-ynyl-cyclopentanol	C22H40O	320	0.66
24.	46.267	1-Heptatriacotanol	C37H76O	536	2.06
25.	46.674	D:A-Friedooleanan-28-al,3-oxo-	C30H48O2	440	13.58
26.	48.264	1-Methyl-1-(6-ethyl-3-octyloxy)-1- silacyclohexane	C16H34OSi	270	2.72
27.	59.570	Tris(2,4-di-tert-butylphenyl)phosphate	C42H63O4P	662	0.75

HPTLC Analysis: A well-defined peak at R_f: 0.21 was observed when using a mobile phase composed of ethyl acetate: formic acid: glacial acetic acid: water (10: 0.5: 0.5: 1.3, v/v/v). The TLC plates exhibited clear spots after being saturated with the mobile phase for 20 minutes at room temperature. The plates were visualized under UV illumination at both 254 nm and 366 nm. In **Fig. 4(a)** and **(b)**, images of TLC plates are

presented, depicting the chromatography of a rutin standard (R) and a hydro alcoholic extract of *P. grandiflora* leaves. Comparison of the chromatograms obtained from the sample and the reference standard solution **Fig. 5(a)** and **(b)**, as well as the retention factors of rutin in the sample and standard solutions, confirmed that the rutin bands in the sample chromatograms corresponded to rutin. The peak of rutin in the sample solution

displayed the same retention parameters as the rutin peak in the rutin standard (Rf: 0.21). The content of rutin in the hydro alcoholic extract of *P.*

grandiflora leaves was found to be 5.3% w/w. additionally; **Fig. 6** presents a 3D view of rutin at 254 nm.

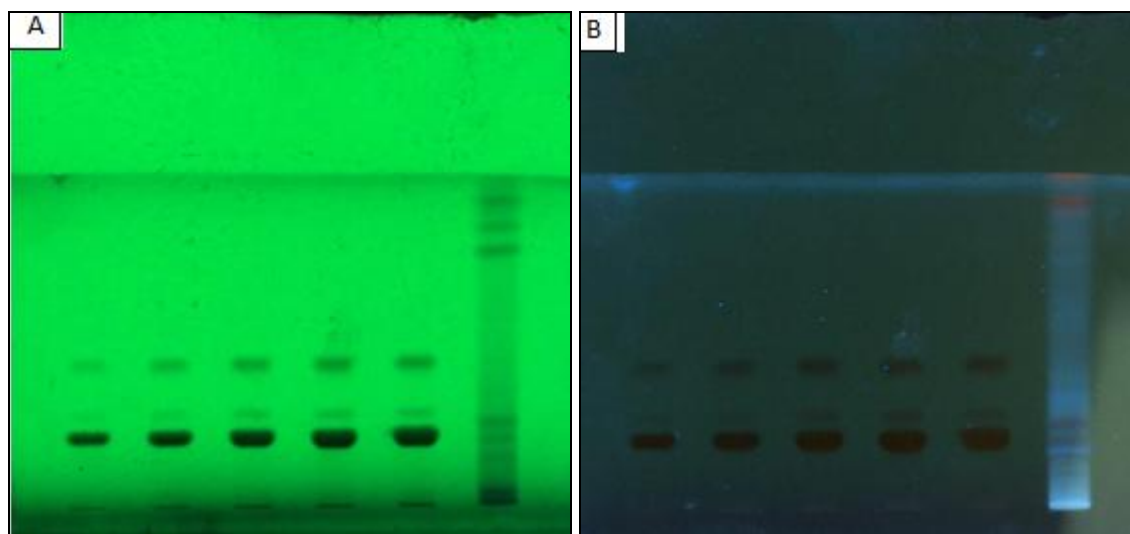


FIG. 4(A): TLC PROFILE OF *P. GRANDIFLORA* HYDRO ALCOHOLIC EXTRACT AT 254 NM INDICATING PRESENCE OF RUTIN (RF VALUE 0.21) (B) TLC PROFILE OF *P. GRANDIFLORA* HYDROALCOHOLIC EXTRACT AT 366NM INDICATING PRESENCE OF RUTIN (RF VALUE 0.21)

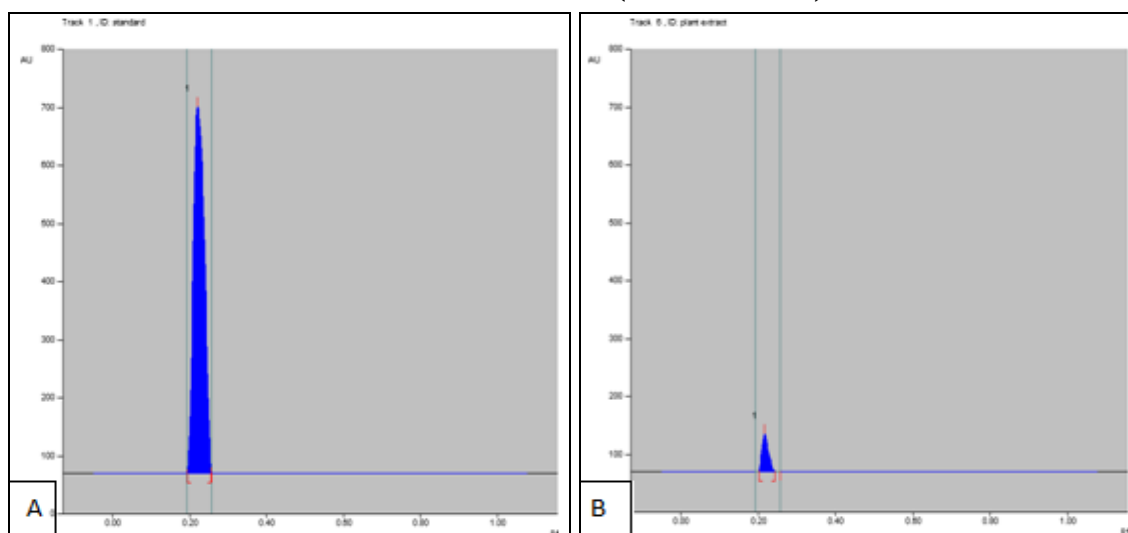


FIG. 5(A): CHROMATOGRAM OF STANDARD RUTIN BY HPTLC (B) CHROMATOGRAM OF *P. GRANDIFLORA* LEAVES HYDRO ALCOHOLIC EXTRACT BY HPTLC

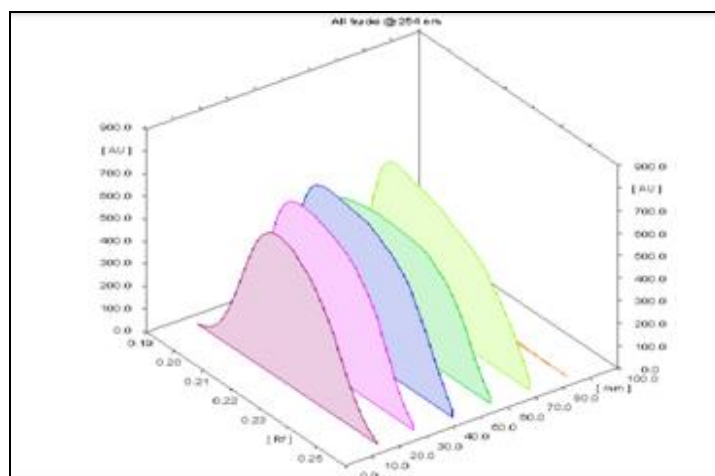


FIG. 6: GRAPH SHOWING 3D VIEW AT RUTIN IN 254NM

DISCUSSION: Many of the phytochemical elements found in plants are recognised to be physiologically active substances with a range of pharmacological actions. Some of these secondary metabolites of plants are important source of natural antioxidants that are preferred over synthetic ones because of safety concerns. The results of preliminary chemical testing confirmed the presence of various classes of bioactive chemical constituents in hydro alcoholic extract of *P. grandiflora* leaves including polyphenols (tannins and flavonoids), steroids, alkaloid, carbohydrate glycosides, cardiac glycosides, and terpenoids. Numerous reports available on phenolic compounds have demonstrated their usefulness in exhibiting potential biological activities such as antioxidant, antidiabetic, hepatoprotective, anti-inflammatory, antimicrobial, anticancer etc. Flavonoids and tannins are considered to be the most promising polyphenolic compounds among plant secondary metabolites. Thus, the total phenolic and flavonoid contents of hydroalcoholic extracts of *P. grandiflora* leaves were determined based on the findings of the phytochemical screening. Quantitative estimation of the total phenolic content of dried leaf hydro alcoholic extract of *P. grandiflora* was found to be 1.57µg/ml (µg of Gallic acid/mg of extract) and total flavonoid content of dried leaves of hydro alcoholic extract of *P. grandiflora* was found to be 2.73µg/ml (µg of Rutin/mg of extract).

Pesticide residue may harm a food chain and the concentration should be within the permissible range for safe human consumption of any herbal product. As per results regarding the determination of contaminants due to organo chlorides and organophosphates compounds by GC-MS analysis, the tested whole plant was found to be free from pesticidal residues. The tested plant was found to be safe.

The hydro alcoholic extract was quantified using HPTLC to determine the content of rutin 5.3% w/w in *P. grandiflora* dried leaves hydro alcoholic extract. Though many studies conducted elsewhere have reported the presence of total phenolics in hydro alcoholic extract, based on the results of total phenol and flavonoid content in the leaves of *P. grandiflora* it can be proposed that biological activity of this species could be due to the presence

of flavonoids and other phenolics in it. The results of GC-MS and preliminary photochemical testing indicated that *P. grandiflora* leaves contained numerous bioactive phytoconstituents belonging to various classes such as tannins, glycosides, alkaloids, flavonoids, steroids, etc. The leaves extract upon quantification by colorimetric methods were found to be rich in phenolic compounds (tannins and flavonoids). Variations can arise when comparing the constituents of herbal medicines. Chromatographic techniques serve as a means to acquire chemical fingerprints, which are utilized for authenticating and identifying plant products. The current study aims to assess the phenolic and flavonoid levels in a hydro alcoholic dried leaf extract, as well as establish a foundation for evaluating the quality and purity of *P. grandiflora* in subsequent research.

ACKNOWLEDGEMENTS: The authors are grateful to the dean and the head of the department of pharmaceutical sciences for providing infrastructure and necessary research facilities.

CONFLICT OF INTEREST: We declare that we have no conflict of interest.

REFERENCES:

1. Ncube NS, Afolayan AJ and Okoh AI: Assessment techniques of antimicrobial properties of natural compounds of plant origin: current methods and future trends. *African Journal of Biotechnology* 2008; 7(12).
2. Anghel AI, Olaru OT, Gatea F, Dinu M, Ancuceanu RV and Istudor V: Preliminary research on *Portulaca grandiflora* Hook. species (Portulacaceae) for therapeutic use. *Farmacia* 2013; 61: 694-702.
3. WHO, Quality control methods for herbal materials, updated edition of Quality control methods for medicinal plant materials 1998.
4. Trezzini GF and Zrýd JP: Two betalains from *Portulaca grandiflora*. *Phytochemistry* 1991; 30(6): 1897-9.
5. Jain AK and Bashir M: *In-vitro* propagation of a medicinal plant *Portulaca grandiflora*. Hook. *World Journal of Agricultural Sciences* 2010; 6(3): 327-30.
6. Yamamoto KI, Kobayashi N, Yoshitama K, Teramoto S and Komamine A: Isolation and purification of tyrosinehydroxylase from callus cultures of *Portulaca grandiflora*. *Plant and Cell Physiology* 2001; 42(9): 969-75.
7. Lim CK, Tiong WN and Loo JL: Antioxidant activity and total phenolic content of different varieties of *Portulaca grandiflora*. *International Journal of Phytopharmacy* 2014; 4(1): 01-5.
8. Devi M, Komal S and Logeshwari B: Preliminary phytochemistry and antidiabetic activity of *Portulaca grandiflora* Hook plant extract on streptozotocin-induced diabetes in rats. *Asian J Pharm Clin Res* 2019; 12(12): 87-90.

9. Lim CK, Tiong WN and Loo JL: Antioxidant activity and total phenolic content of different varieties of *Portulaca grandiflora*. Int J Phytopharm 2014; 4(1): 01-5.
10. Vongsak B, Sithisarn P, Mangmool S, Thongpraditchote S, Wongkrajang Y and Gritsanapan W: Maximizing total phenolics, total flavonoids contents and antioxidant activity of *Moringa oleifera* leaf extract by the appropriate extraction method. Industrial Crops and Products 2013; 44: 566-71.
11. Budiawan A, Purwanto A, Puradewa L, Cahyani ED and Purwaningsih CE: Wound healing activity and flavonoid contents of purslane (*Portulaca grandiflora*) of various varieties. RSC Advances 2023; 13(15): 9871-7.
12. Kaur S and Mondal P: Study of total phenolic and flavonoid content, antioxidant activity and antimicrobial properties of medicinal plants. J Microbiol Exp 2014; 1(1): 00005.
13. Canini A, Alesiani D, D'Arcangelo G and Tagliatesta P: Gas Chromatography–Mass Spectrometry analysis of phenolic compounds from *Carica papaya* L. leaf. J Food Compos Anal 2007; 20(7): 584-90.
14. Annalakshmi R, Mahalakshmi S, Charles A and Sahayam CS: GC–MS and HPTLC analysis of leaf extract of *Madhuca longifolia* (Koenig) Linn. Drug Invention Today 2013; 5(2): 76-80.
15. Mahabaleshwara K, Chandrasekhar N and Govindappa M: Phytochemical investigations of methanol leaf extracts of *Randia spinosa* using column chromatography, HPTLC and GC-MS. Nat Prod Chem Res 2016; 4(202): 2.
16. Gunalan G, Krishnamurthy V and Saraswathy A: GC-MS and HPTLC fingerprinting of *Bauhinia variegata* leaves for anticancer activity. World J Pharm Res 2014; 3(9): 1313-39.
17. Patel DK, Patel K and Dhanabal SP: Phytochemical standardization of *Aloe vera* extract by HPTLC techniques. Journal of Acute Disease 2012; 1(1): 47-50.
18. Kaushik S, Sharma P, Jain A and Sikarwar MS: Preliminary phytochemical screening and HPTLC fingerprinting of *Nicotiana tabacum* leaf. J Pharm Res 2010; 3(5): 144.
19. Varadharajan V, Janarthanan UK and Krishnamurthy V: Physicochemical, phytochemical screening and profiling of secondary metabolites of *Annona squamosa* leaf extract. World Journal of Pharmaceutical Research 2012; 1(4): 1143-64.

How to cite this article:

Malik M, Dhiman A, Gulia SK and Kumar A: Determination of total flavonoid content, total phenolic content, GC-MS and HPTLC analysis of hydro alcoholic extract of dried leaves of *Portulaca grandiflora* hook. Int J Pharmacognosy 2025; 12(7): 599-06. doi link: [http://dx.doi.org/10.13040/IJPSR.0975-8232.IJP.12\(7\).599-06](http://dx.doi.org/10.13040/IJPSR.0975-8232.IJP.12(7).599-06).

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