Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/jptcp.v31i6.6432

PHYTOCOMPONENTS ANALYSIS OF *DELONIX REGIA* (GULMOHAR) LEAVES EXTRACTS: EXPLORING BIOACTIVE COMPOUNDS AND POTENTIAL HEALTH BENEFITS

Dr. Saeed Ahmed Sheikh[1*], Dr. Asadullah[2], Dr.Asif Ahmed[3], Dr. Shaikh Nadeem Ahmed[4], Dr. Farhat Jahan[5], Dr Shazia Nawaz[6], Dr Shazia Dawood[7]

[1*]MBBS, M.Phil. PhD Scholar, Assistant Professor, Dept. of Pharmacology and Therapeutics, Fazaia Ruth Pfau Medical College, Karachi-74350, Pakistan, Email: sheikhsa63@gmail.com
[2]MBBS, M.Phil. MPH, PhD Scholar, Lecturer, Department of Pharmacology, Shaheed Mohtarma Benazir Bhutto Medical College, Karachi, Email: drasadali361@gmail.com
[3]Professor, Head of Pharmacology and Therapeutics Department, Baqai Medical College - Baqai Medical University, Karachi.Email: drasifahmed@baqai.edu.pk
[4]Chairman Department of Pharmacology and Therapeutics, Baqai Medical College - Baqai Medical University, Karachi, Email: dr.nadeem_ahmed@baqai.edu.pk
[5]MBBS, MPH, Lecturer, Department of Community Medicine, Shaheed Mohtarma Benazir Bhutto Medical College, Karachi, Email: drfarhatasad361@gmail.com
[6]Senior Lecturer, Department of Pharmacology and Therapeutics, Fazaia Ruth Pfau Medical College, Karachi-74350, Pakistan, Email: shazianawaz19@gmail.com
[7]Assistant Professor, Pharmacy and Allied Health Science, Iqra University North Campus, Karachi, Pakistan, Email: shazia.dawood@iqra.edu.pk

***Corresponding Author:** Saeed Ahmed Sheikh
*Assistant Professor, Dept. of Pharmacology and Therapeutics,Fazaia Ruth Pfau Medical College, Karachi-74350, PakistanEmail: sheikhsa63@gmail.com

ABSTRACT:

Background: Phytocomponents investigation of *Delonix regia* leaves extracts involves the systematic study of the diverse chemical compounds present in the leaves of the *D. regia* tree. *D. regia*, commonly known as the Gulmohar, is renowned for its vibrant red-orange flowers and ornamental value. However, beyond its aesthetic appeal, researchers have increasingly turned their attention to the potential health benefits offered by its leaves.

Objective: The objective of this study was phytocomponents analysis of *D. regia* leaves extracts. This study was aimed to investigate the chemical composition, identification and quantification of the *D. regia* leaves extracts of n-hexane and acetone.

Methodology: *D. regia* leaves were procured from the local garden of Karachi University. The plant was identified and authenticated from herbarium of the botany department of Karachi University. Extraction of plant material was achieved through Soxhlet extraction. The gas chromatography techniques were used for fractionation and purification of the plant extract, moreover mass spectrometry technique was used for identification of secondary metabolites.

Results: GC-MS analysis on the *D. regia* acetone and n-hexane leaf extract was performed, and different range of phytocomponents were identified; distinguish through their relative abundance and peak numbers. In the acetone extracts of *D. regia* leaves, the major compound was found to be 2-Pentanone, 4-hydroxy-4-methyl- (33.16%). Other components were Phytol (29.15%), Vitamin E

(19.79%). On the other hand, in the n-hexane extracts of *D. regia* leaves di-iso-octyl ester (18.75%), nonacosane (14.61%), lupeol (10.95%), 1, 30-triacontanediol (7.27%), and phytol (6.47%) were present. This analysis emphasizes the distinct chemical profiles of *D. regia* leaves under different extraction solvents, highlighting the presence of a wide range of phytocomponents with potential bioactive properties.

Conclusion: This investigation give emphasis to the different chemical compositions of *D. regia* leaves under different extraction solvents, existence of a wide range of phytocomponents suggests the potential bioactive properties, which could be a factor to its conventional medicinal uses and serve as a source for pharmaceutical and nutraceutical development.

Keywords: *Delonix regia*, acetone, n-hexane, GC-MS, phytocomponents,

INTRODUCTION:

The *Delonix regia* tree, also known as Gulmohar, Royal Poinciana, and Flamboyant, originates from Madagascar and was first discovered by botanist Wensel Brojer in its native habitat during the early 19th century. Since its discovery, this species has become widely distributed across subtropical and tropical regions worldwide. It is extensively cultivated in various parts of the world, particularly as a garden and avenue tree in Pakistan. Originally native to Madagascar, the *D. regia* tree has found adaptation in diverse climates and is celebrated for its vibrant foliage and striking blossoms, adding beauty to landscapes across the globe **(1).** The term "delonix" originates from the Greek "delos," meaning visible, while "regia" stems from the Latin "Regis," signifying royal, regal, or magnificent. This nomenclature reflects the tree's grandeur and visibility **(2).**

D. regia, a member of the legume family Caesalpiniaceae, is renowned as the flame of the forest in Nigeria. This captivating, semi-deciduous tree can reach heights of approximately 18 meters. Propagation is typically achieved through seeds, although germination can be slow. Its leaflets, generally less than 12 mm in length, are arranged oppositely, adorned with abundant scarlet flowers borne on lengthy stalks. The tree bears long, pendant pods that start out green and soft in youth, gradually transforming into dark brown, rigid structures upon maturation. Upon ripening, these pods split open, unveiling elongated, sturdy seeds. *D. regia* is recognized for its medicinal properties, containing active compounds or secondary metabolites with biological significance. The entire plant holds medicinal potential, with its constituents offering various therapeutic benefits. The botanical name "delonix" evokes visibility, while "regia" reflects regal magnificence, capturing the tree's splendor and importance within its ecosystem.

Primary plant constituents encompass essential nutritional elements found in plants, including common sugars, amino acids, proteins, and chlorophyll, which generally lack significant medicinal properties. In contrast, secondary plant constituents, also termed secondary metabolites, comprise alkaloids, terpenoids, saponins, phenolic compounds, flavonoids, and tannins. These compounds are pivotal for various biological or pharmacological activities, contributing to the medicinal efficacy of plants. Unlike primary constituents, secondary metabolites play crucial roles in plant defense mechanisms and ecological interactions, often serving as potent agents in traditional and modern medicine due to their diverse bioactive properties. (**6, 5, 4, 3**)

An examination of *D. regia* through pharmacological, phytochemical, and proximate analyses has revealed the presence of bioactive compounds and essential minerals, including tannin, saponin, phenolics, flavonoids, reducing sugars, triterpenoids, anthraquinones, amino acids, alkaloids, sodium, potassium, calcium, phosphorus, and iron (**8, 7**). The phytochemical constituents vary across different parts of the plant:

- Flowers: Alkaloids, cardiac glycosides, carbohydrates, flavonoids, phenols, phlobatannins, saponins, tannins, terpenoids, quinines, and diterpenes. (**9**)
- Leaves: Alkaloids, glycosides, flavonoids, saponins, proteins, amino acids, carbohydrates, diterpenes, and steroids. (**10**)
- Bark: Alkaloids, flavonoids, phenols, tannins, sugars, proteins, and amino acids. (**11**)

- Seeds: Flavonoids, fixed oils, fats, steroids, triterpenoids, and carbohydrates. (**12**)
- Roots & Stems: Alkaloids, saponins, flavonoids, and steroids. (**13**)

These findings underscore the diverse array of phytochemicals present in *D. regia*, highlighting its potential for various medicinal and nutritional applications. The present study was designed to investigate the chemical composition and quantify the bioactive compounds present in *D. regia* leaves extracts in polar (acetone) and non-polar (n-Hexane) solvents.

MATERIAL AND METHOD:

Study Design:

The experimental investigation took place within the Department of Pharmacology and Therapeutics at Baqai Medical College and University of Karachi, utilizing in-vitro methodologies over a span of 6 months.

Plant Collection and Authentication:

D. regia leaves were obtained from the local garden at Karachi University in November 2022. The plant was identified and verified through authentication at the herbarium of the Botany Department of Karachi University, with the assigned voucher number 97626.

Plant Material Extraction:

Various methods exist for extracting medicinal plant compounds, including maceration, infusion, decoction, percolation, digestion, Soxhlet extraction, superficial extraction, ultrasound-assisted, and microwave-assisted extraction. The selection of an appropriate method hinges on factors like the plant material's properties, solvent type, solvent pH, temperature, and the intended application of the final products.

The freshly harvested *D. regia* leaves were gathered and sorted, followed by a meticulous cleansing process with tap water to remove any adhering dirt, and then rinsed with distilled water to eliminate contaminants. Subsequently, the leaves were air-dried, chopped on a cutting board, and finely mashed using a blender. The resulting powder was subjected to extraction utilizing n- Hexane (HEX) and acetone (ACT) solvent through a Soxhlet apparatus. The extracted solution was concentrated using a rotary vacuum evaporator and subsequently preserved in a desiccator for storage, ensuring the integrity and longevity of the extract for further analysis and potential applications. (**4, 3, 2, 1**).

Gas Chromatography-Mass Spectrometry (GC-MS):

The chemical composition of the *D. regia* leaves involved identifying both the non-polar fraction (n-hexane) and polar fraction (acetone). This identification process relied on computer evaluation of the mass spectra of the sample through the National Institute of Standards and Technology (NIST) database using automated mass spectral deconvolution and identification software (AMDIS). Alternatively, spectra of unknown components were compared with those of known components stored in the library at the Industrial Analytical Centre (IAC) within the H.E.J. Research Institute of Chemistry, UoK, Pakistan. The identity of the detected phytochemicals was
assessed by comparing the masses of their molecular ions, base ions, and fragment ions, along with their peak intensities, against reference standards in the database. The names, molecular weights, and structures of the components of the test materials were subsequently determined.

Method Information	
% Syringe Fill for Cleaning (%):	40
Injection Speed (µl/s):	50
Oven	
Equilibration Time	0.5 min
Max Temperature	360 degrees ^{0}C
50 °C for 5 min	

#1	then 7 °C/min to 200 °C for 20 min
#2	then 7 °C/min to 300 °C for 30 min
Run Time	90.714 min
DB-35MS	360 °C: 30 m x 320 μm x 0.25 μm
In:	Front SS Inlet He
Out: Vacuum (Initial)	50 °C
Pressure	1.9952 psi
Flow	1.5 mL/min
Average Velocity	44.635 cm/sec

RESULTS:

The investigation expose a rich variety of phytochemicals within the *D. regia* leaf extract (refer to Table 1-4 and Fig 1 & 2). GC-MS analysis of the acetone leaf extract of *D. regia* showed presence of a variety of phytochemicals, identified based on their relative abundance and peak numbers. Notably, 2-Pentanone, 4-hydroxy-4-methyl- was found to constitute 33.16%, phytol accounted for 29.15%, squalene comprised 4.16%, Vitamin E constituted 19.79%, stigmasterol represented 0.99%, β-Sitosterol contributed 1.57%.

Furthermore, 4,4,6a,6b,8a,11,11,14b- Octamethyl1,4,4a,5,6,6a,6b,7,8,8a,9,10,11,12,12a,14,14a,14b-octadecahydro-2H-picen-3-one (2.37%) α-Amyrin, and Lupeol (8.8%) were also present. Upon deeper examination of the identified compounds within the acetone extracts of *D. regia* leaves, it was discovered that 2- Pentanone, 4-hydroxy-4-methyl-, constituted the highest percentage peak area at 33.16%, followed by Phytol at 29.15%, and Vitamin E at 19.79%.

The examination of the n-hexane extract unveiled a spectrum of diverse phytochemicals, identified based on their relative abundance and peak numbers. Among the constituents detected were Hexadecane, 2,6,11,15-tetramethyl at 0.42%, Heptadecane, 2,6,10,15-tetramethyl-, Pentadecane at 0.57%, Hexadecane at 0.68%, Heptadecane, 2,6,10,15-tetramethyl at 1.55%,

Tetratriacontane at 0.78%, Heneicosane at 1.48%, n-Hexadecanoic acid, Phthalic acid, butyl tetradecyl ester at 0.74%, Phytol at 6.47%, Cyclopropaneoctanoic acid, 2-[[2-[(2-ethylcyclopropyl)methyl]cyclopropyl]methyl]- methyl ester at 0.63%, Tetradecane, 2,6,10-trimethyl- at 1.16%, Nonadecane at 1.22%, Heneicosane, 11-(1-ethylpropyl)-, Heptacosane at 4.01%, 1,2-Benzenedicarboxylic acid, diisooctyl ester at 18.75%, Di-n-octyl phthalate, Octacosane at 2.25%, Octadecane, 1-chloro- at 1.18%, Nonacosane at 14.61%, Squalene, Triacontane at 0.5%, Hentriacontane at 3.29%, 17-Octadecynoic acid at 0.35%, Octadecane, 1-

chloro- at 1.18%, Lupeol at 10.95%, 1,30-Triacontanediol at 7.27%, α-Amyrin at 3.99%, Ethyl iso-allocholate at 1.59%. Upon closer inspection of the identified compounds in the n-hexane extracts of *D. regia* leaves, it was revealed that the highest percentage peak areas were attributed to di-iso-octyl ester at 18.75%, Nonacosane at 14.61%, Lupeol at 10.95%, 1,30-Triacontanediol at 7.27%, and Phytol at 6.47%.

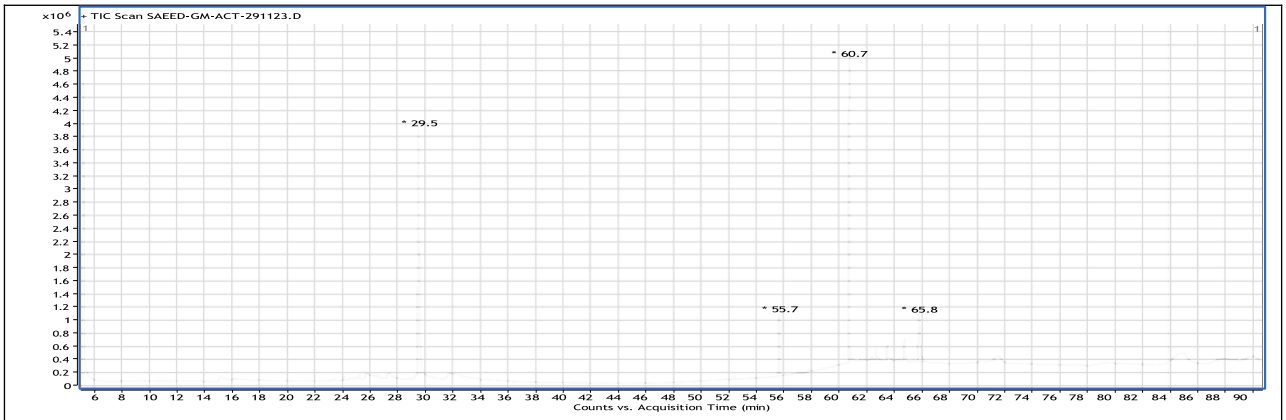
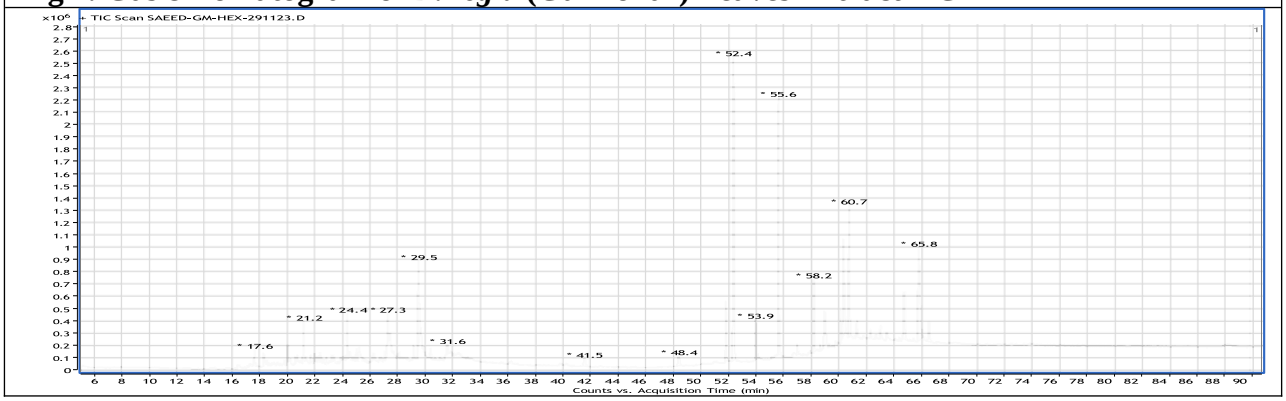


Fig 1: Gas chromatogram of *D. regia* (Gulmohar) Leaves Extract-ACT



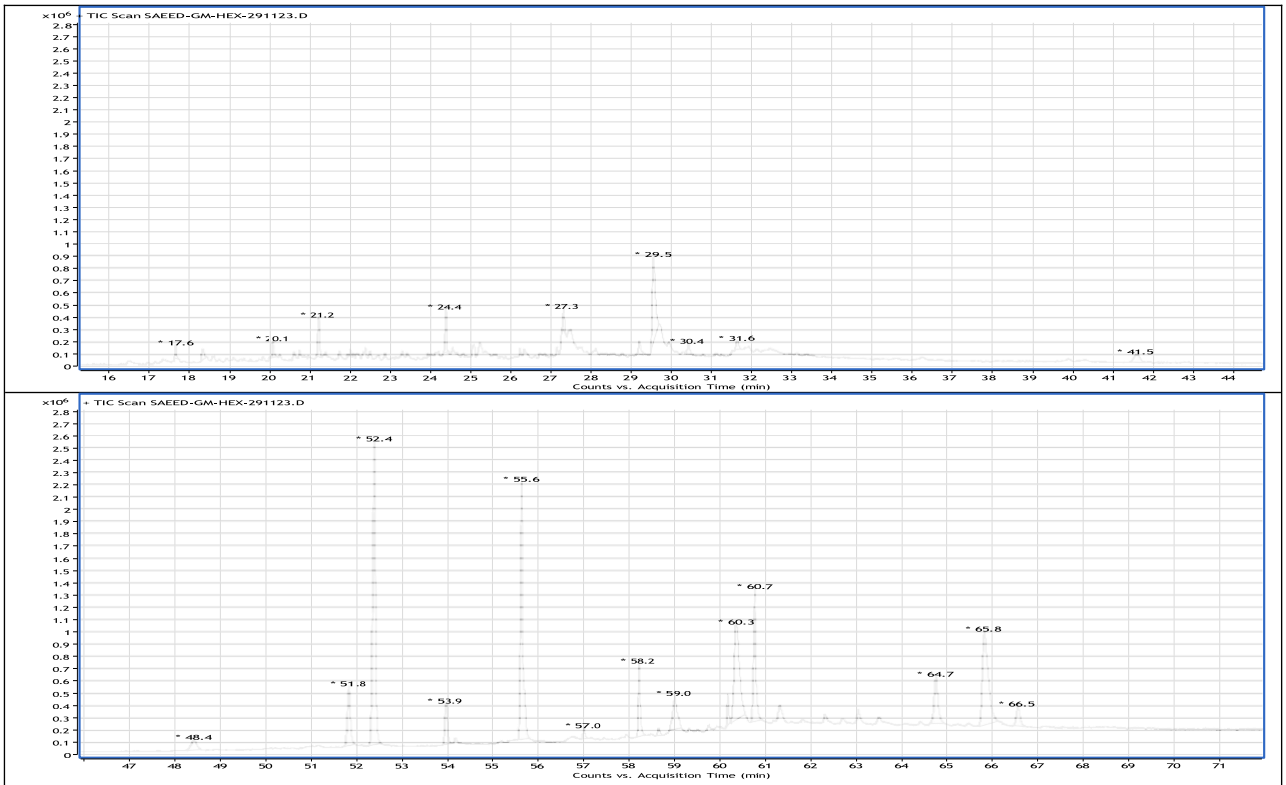


Fig 2: Gas chromatogram of *D. regia* (Gulmohar) Leaves Extract- HEX

Table1: GC-MS of *D. regia* Leaves Extract-ACT

Peak No.	RT	Phytocomponents	Molecular formula	Molecular Weight	Area Sum %
1	5.3	2-Pentanone, 4-hydroxy-4-methyl-	$C_6H_{12}O_2$	116	33.16
2	29.5	Phytol	$C_{20}H_{40}O$	296	29.15
3	55.7	Squalene	$C_{30}H_{50}$	410	4.16
4	60.7	Vitamin E	$C_{29}H_{50}O_2$	430	19.79
5	62.7	Stigmasterol	$C_{29}H_{48}O$	412	0.99
6	63.5	β-Sitosterol	$C_{29}H_{50}O$	414	1.57
7	64.7	4,4,6a,6b,8a,11,11,14b-Octamethyl-1,4,4a,5,6,6a,6b,7,8,8a,9,10,11,12,12a,14,14a,14b-octadecahydro-2H-picen-3-one	$C_{30}H_{48}O$	424	2.37
8	64.7	α-Amyrin	$C_{30}H_{50}O$	426	
9	65.8	Lupeol	$C_{30}H_{50}O$	426	8.8

Table2: Activity of phytocomponents present in *D. regia* leaves extract-ACT

Phytocomponents	Nature	Activity
2-Pentanone, 4-hydroxy-4-methyl-	Ketone	Antimicrobial(14)
hytol	Diterpene	Antimicrobial, Anticancer, Diuretic, Anti-inflammatory (15)
Squalene	Triterpene	Antibacterial, Antioxidant, Antitumor, Cancer Preventive, Immunostimulant, Chemo Preventive, Lipoxygenase-Inhibitor, Pesticide(15)
Vitamin E		Antiageing, Analgesic, Antidiabetic, Antiinflammatory, Antioxidant, Antidermatitic, Antileukemic, Antitumor, Anticancer, Hepatoprotective, Hypocholesterolemic, Antiulcerogenic, Vasodilator, Antispasmodic, Antibronchitic, Anticoronary(15)
Stigmasterol	Steroid	Antimicrobial, Anticancer, Antiarthritic, Antiasthma, Diuretic, Anti-Inflammatory (15)
β-Sitosterol	Steroid	Antimicrobial, Anticancer, Antiarthritic, Antiasthma, Diuretic, Anti-Inflammatory (15)
4,4,6a,6b,8a,11,11,14b-Octamethyl-1,4,4a,5,6,6a,6b,7,8,8a,9,10,11,12,12a,14,14a,14b-octadecahydro-2H-picen-3-one		Anti-cancer, Antioxidant, Antifungal and Hypocholesterolemic(16)
α-Amyrin		Anti-inflammatory, Antioxidant, antimicrobial(17)
Lupeol	Triterpene compound	Antimalarial, antioxidant, antiflue, antihyperglycemic, antitumor, antiviral, pesticide, cytotoxic, anti-inflammatory (15)

Table 3: GC-MS of *D. regia* Leaves Extract-HEX

Peak No.	RT	**Phytocomponents**	**Molecular Formula**	**Molecular Weight**	Area Sum %
1	17.6	Hexadecane, 2,6,11,15-tetramethyl	$C_{20}H_{42}$	282	0.42
2	18.3	Pentadecane	$C_{15}H_{32}$	212	0.57
3	20.1	Hexadecane	$C_{16}H_{34}$	226	0.68
4	21.2	Heptadecane, 2,6,10,15-tetramethyl-	$C_{21}H_{44}$	296	1.55
5	24.4	Heneicosane	$C_{21}H_{44}$	296	1.48
6	27.3	Tetratriacontane	$C_{34}H_{70}$	478	0.78
7	27.3	n-Hexadecanoic acid	$C_{16}H_{32}O_2$	256	
8	29.2	Phthalic acid, butyl tetradecyl ester	$C_{26}H_{42}O_4$	418	0.74
9	29.5	Phytol	$C_{20}H_{40}O$	296	6.47
10	30.4	Cyclopropaneoctanoic acid, 2-[[2-[(2-ethylcyclopropyl)methyl]cyclopropyl]methyl]-, methyl ester	$C_{22}H_{38}O_2$	334	0.63
11	41.5	Tetradecane, 2,6,10-trimethyl-	$C_{17}H_{36}$	240	1.16
12	48.4	Nonadecane	$C_{19}H_{40}$	268	1.22
13	48.4	Heneicosane, 11-(1-ethylpropyl)-	$C_{26}H_{54}$	366	
14	51.8	Heptacosane	$C_{27}H_{56}$	380	4.01
15	52.4	1,2-Benzenedicarboxylic acid, diisooctyl ester	$C_{24}H_{38}O_4$	390	18.75
16	52.4	Di-n-octyl phthalate	$C_{24}H_{38}O_4$	390	
17	53.9	Octacosane	$C_{28}H_{58}$	394	2.25
	55.6	Nonacosane	$C_{29}H_{60}$	408	14.61
9	55.7	Squalene	$C_{30}H_{50}$	410	
20	57	Triacontane	$C_{30}H_{62}$	422	0.5
21	58.2	Hentriacontane	$C_{31}H_{64}$	436	3.29
22	58.6	17-Octadecynoic acid	$C_{18}H_{32}O_2$	280	0.35
23	60.1	Octadecane, 1-chloro-	$C_{18}H_{37}Cl$	288	1.18
24	60.3	Lupeol	$C_{30}H_{50}O$	426	10.95
25	60.7	1,30-Triacontanediol	$C_{30}H_{62}O_2$	454	7.27
26	64.7	α-Amyrin	$C_{30}H_{50}O$	426	3.99
27	66.5	Ethyl iso-allocholate	$C_{26}H_{44}O_5$	436	1.59

Table 4: Activity of phytocomponents present in *D. regia* Leaves Extract-HEX

Phytocomponents	**Nature**	**Activity**
Hexadecane, 2,6,11,15-tetramethyl	Hydrocarbon	Flavoring agent(18)
Pentadecane	Hydrocarbon	Antimicrobial and antioxidant activity(19)
Hexadecane	Hydrocarbon	Antifungal, Antibacterial, Antioxidant(19)
Heptadecane, 2,6,10,15-tetramethyl-	Hydrocarbon	Dyeing, anti-HIV, anticancer(20)
Heneicosane	Hydrocarbon	Antineoplastic, oviposition-attractant pheromone (for trapping mosquitoes) Antiasthmatics, urine

		acidifiers Antimicrobial
Tetratriacontane	Hydrocarbon	Antiasthmatics, Drugs for disorders of the urinary system (19)
n-Hexadecanoic acid	Organic acid	Antimicrobial (14)
Phthalic acid, butyl tetradecyl ester		antibacteria l activity(21)
Phytol	Diterpene	Antimicrobial, anticancer, diuretic, anti-inflammatory (15)
Cyclopropaneoctanoic acid, 2-[[2-[(2-ethylcyclopropyl)methyl]cyclopropyl]meth yl]-, methyl ester	Fatty acid	No activity reported
Tetradecane, 2,6,10-trimethyl-	Isoprenoid lipid	Antifungal, antibacterial, and nematicidal(22)
Nonadecane	Hydrocarbon	Binding material(23)
Heneicosane, 11-(1-ethylpropyl)-	Pheromone	Major component of safflower flower essential oil(24)
Heptacosane	Aliphatic hydrocarbon	Anti-oxidant activity, Antibacterial, Insecticidal(25)
1,2-Benzenedicarboxylic acid, diisooctyl ester	Organic acid	Antimicrobial (14)
Di-n-octyl phthalate	Benzoic acid ester.	Antimicrobial, Solvent, Plastilixer, Pesticide, Repellent(26)
Octacosane	Hydrocarbon	Antimicrobial activity, Insecticidal activity(24)
Nonacosane	Aliphatic hydrocarbon	Antibacterial(27)
Squalene	Triterpene	Antibacterial, antioxidant, antitumor, cancer preventive, immunostimulant, chemo preventive, lipoxygenase-inhibitor, pesticide (15)
Triacontane		Antibacterial, antidiabetic, and antitumor activities(28)
Hentriacontane	Long chain hydrocarbon	Antibacterial activity(19)
17-Octadecynoic acid	Fatty acid	inhibit the metabolism of arachidonic acid by cytochrome P450 in renal cortical microsomes of rats(29)
Octadecane, 1-chloro-		Nutraceutical components(30)
Lupeol	Triterpene Compound	Antimalarial, antioxidant, antiflue, antihyperglycemic, antitumor, antiviral, pesticide, cytotoxic, anti- inflammatory (15)
1,30-Triacontanediol	Fatty alcohol	No activity reported
α-Amyrin	Phytosterol	Anti-inflammatory,antioxidant, antimicrobial(17)
Ethyl iso-allocholate	Steroid	Antimicrobial, Anti-inflammatory, Diuretic(31)

DISCUSSION:

Gas chromatography is recognized as the most appropriate method for determining the number of components and their particular proportions within a complex mixture of compounds. Gas chromatography with mass spectrometry methods were devised and authenticate for quantitatively determining the composition of *D. regia* leaves in acetone and n-hexane extracts. In total, 9 compounds from the acetone extracts and 27 compounds from the hexane leaves extract of *D. regia* were recognized by GC-MS.

Upon examination of the recognized compounds within the n-hexane extract of *D. regia* leaves, phytol represented 6.47%, while squalene and α-amyrin were found to be 3.99%. Lupeol constituted 10.95% of the composition.

Through GC-MS examination of the *D. regia* leaf extract obtained with acetone, a variety of phytocomponents were acknowledged based on their relative abundance. Particularly, phytol represented 29.15% of the composition, while squalene was 4.16%. Furthermore, α-amyrin was 8.8% of the total composition, together with lupeol. Vitamin E constituted 19.79%, Stigmasterol represented 0.99%, and β Sitosterol contributed 1.57% of the total composition. Similarly, Chhabra and Gupta (2015) reported that in their study, Squalene comprised 0.70%, Vitamin E constituted 2.03%, Stigmasterol represented 1.26%, and β Sitosterol contributed 1.28%, n- Hexadecanoic acid constituted 5.39%, 2,6,10,14,18,22-tetracosahexaene, 2,6,10,15,19,23- hexamethyl-, (all-E) accounted for 0.70%, Octadecane represented 4.01%, and Nonacosane comprised 13.57% of the total composition in the methanol extracted fraction of flower petals. While in acetone extract fraction they found Vitamin E, sitosterol, azulene, naphthalene, heptadecene, nonadecane octadecane. Plant sitosterols might offer benefits in preventing certain cancers, while Vitamin E serves as an effective antioxidant. Research suggests that consuming a diet rich in phytosterols, such as β-sitosterol, campesterol, and ergosterol, could hinder cholesterol absorption. By competing for absorption in the intestine, these phytosterols may contribute to reducing serum cholesterol levels. Squalene exhibits chemopreventive properties against colon carcinogenesis (32).

Furthermore, Chhabra and Gupta (2015) documented that in acetone extract of flower petals they observed n-Hexadecanoic acid, Octadecane, and Nonacosane, Vitamin E, sitosterol, azulene, naphthalene. Other study showed presence of alkaloids, flavonoids, saponins, phenols and carbohydrates in ethanolic extract of *D. regia* leaf (10).

Phytol emerges as the predominant compound in the *D. regia* leaf extract obtained with acetone and n-hexane. Its efficacy extends across various stages of arthritis, demonstrating both preventative and therapeutic benefits against the condition. Research indicates that substances like phytol, promote reactive oxygen species, hold promise as a novel pharmaceutical class for treating rheumatoid arthritis and potentially other chronic inflammatory ailments. Phytol, a crucial acyclic diterpene alcohol, serves as a precursor for vitamins E and K (15).

Lupeol demonstrates a wide range of biological activities, serving as antiprotozoal, anti-inflammatory, antitumor, and chemopreventive agents (15).

The *D. regia* leaf extract in current study obtained with n-hexane contains a various range of components, reflecting the complex chemical composition of this plant species. Acknowledged compounds include alkanes like hexadecane and heptadecane, as well as cyclic compounds such as cyclopropaneoctanoic acid. Additionally, terpenoids like α-amyrin and ethyl iso-allocholate were also found, suggesting potential pharmacological significance. The presence of plasticizers like phthalic acid esters raises concerns about environmental contamination or extraction process artifacts. Chlorinated hydrocarbons like 1-chloro-octadecane were also detected, warranting attention due to their potential toxicity.

CONCLUSION:

The phytocomponents analysis of *D. regia* leaves extracts using n-hexane and acetone solvents revealed the presence of different phytochemicals, including terpenoids, fatty acids, phenolic compounds, and alkaloids. These compounds have a range of pharmacological activities, including

antioxidant, anti-inflammatory, antimicrobial, and anticancer properties.

RECOMMENDATIONS:

The results of this study emphasize the ability of *D. regia* leaves extracts as an important source of bioactive compounds for pharmaceutical and nutraceutical development. Further investigation is necessary to clarify the specific mechanisms of action and therapeutic potential of these phytocomponents.

References:

1. Ingle KP, Deshmukh AG, Padole DA, Dudhare MS, Moharil MP, Khelurkar VC. Phytochemicals: Extraction methods, identification, and detection of bioactive compounds from plant extracts. *J Pharmacogn Phytochem.* 2017;6:32–6.
2. Azwanida NN. A review on the extraction methods use in medicinal plants, principle, strength, and limitation. *Med Aromat Plants.* 2015;4:196.
3. Pandey A, Tripathi S. Concept of standardization, extraction, and pre-phytochemical screening strategies for herbal drug. *J Pharmacogn Phytochem.* 2014;2:115–9.
4. Doughari JH. Phytochemicals: Extraction methods, basic structures, and mode of action as potential chemotherapeutic agents, phytochemicals—a global perspective of their role in nutrition and health. In: Venketeshwer R, editor. *A Global Perspective of Their Role in Nutrition and Health.* InTech; 2012. [Last accessed 2019 Jun. 10]. Available from: www.intechopen.com
5. Rungsung W, Ratha KK, Dutta S, Dixit AK, Hazra J. Secondary metabolites of plants in drugs discovery. *World J Pharm Res.* 2015;4:604–13.Sofowora A. The present status of knowledge of the plants used in traditional medicine in western Africa: A medical approach and a chemical evaluation. *J Ethnopharmacol.* 1980;2:109–18. [PubMed].
6. Das K, Tiwari RK, Shrivastava DK. Techniques for evaluation of medicinal plant products as antimicrobial agents: Current methods and future trends. *J Med Plants Res.* 2010;4:104– 11.
7. Altemimi A, Lakhssassi N, Baharlouei A, Watson DG, Lightfoot DA. Phytochemicals: Extraction, isolation, and identification of bioactive compounds from plant extracts. *Plants.* 2017;6:42. [PMC free article] [PubMed].
8. Hait, M., Nemu, S.C., Kashyap, N.K. and Chaturwedi, A.,. Physicochemical and phytochemical exploration on flower of Delonex regia. Journal of Medicinal Plants: 2018, 6(3):15-18.
9. Bhorga, P.H. and Kamle, S., Comparative Phytochemical Investigation and Determination of Total Phenols and Flavonoid Concentration in Leaves and Flowers Extract of D. regia (Boj. Ex. Hook). Journal of Drug Delivery and Therapeutics 2019; 9(4-s):1034-1037.
10. Vala, M., & Maitreya, B. Phytochemical analysis and total tannin content (TTC) of D. regia (Bojer ex. hook) Raf. bark by using different solvents collected from Saurashtra region. IABCD 2022;1(2): 144-148.
11. Shantha Sheela, N. Pharmacognostical, Phytochemical and Pharmacological Studies of D. regia (Boojer. Hook.) Raf (Doctoral dissertation, College of Pharmacy, Madras Medical College, Chennai) Research journal of pharmacognosy and phytochemistry 2016; 8(2): 70- 74
12. Bhokare, P., Khadke, A., Kuchekar, G. and Kulkarni, S., Comparative study of different extraction technique and phytochemical screening of D. regia. J Pharmacognosy Phytochem 2018; 7(4):133-138.
13. Shettima AY, Karumi Y, Sodipo OA, Usman H, Tijjani MA. Gas Chromatography-Mass Spectrometry (GC-MS) analysis of bioactive components of ethyl acetate root extract of Guiera senegalensis JF Gmel. Journal of Applied Pharmaceutical Science. 2013 Mar 28;3(3):146-50.
14. Sudha T, Chidambarampillai S, Mohan VR. GC-MS analysis of bioactive components of aerial parts of Kirganelia reticulata Poir (Euphorbiaceae). Journal of Current Chemical and Pharmaceutical Sciences. 2013;3(2):113-22.
15. Fagbemi KO, Aina DA, Coopoosamy RM, Olajuyigbe OO. Gas chromatography-mass spectrometry chemical profile investigation and biological activities of ethylacetate fraction of

Baobab (Adansonia digitata L.) pulp used in the treatment of urinary tract infections. Journal of Medicinal Plants for Economic Development. 2022 Jan 11;6(1):117.
16. Ferdosi MF, Khan IH, Javaid A, Fardosi MF. GC-MS examination of methanolic extract of Cirsium arvense flower. Pak. J. Weed Sci. Res. 2021 Apr 1;27(2):173-80.
17. Pammi N, Bhukya KK, Lunavath RK, Bhukya B. Bioprospecting of palmyra palm (Borassus Flabellifer) nectar: unveiling the probiotic and therapeutic potential of the traditional rural drink. Frontiers in Microbiology. 2021 Jun 28;12:683996.
18. Faridha Begum I, Mohankumar R, Jeevan M, Ramani K. GC–MS analysis of bio-active molecules derived from Paracoccus pantotrophus FMR19 and the antimicrobial activity against bacterial pathogens and MDROs. Indian journal of microbiology. 2016 Dec;56:426-32.
19. Patil K, Singh DM. GC-MS Analysis of fresh water Cylindrospermum sp. PCC518, Cylindrospermum sp. PCC 567 ethanol and hexane extracts. Int. J. Herb. Med. 2022;10:15-25.
20. R. Singh, S. A. Dar and P. Sharma, Antibacterial activity and toxicological evaluation of semi purified hexane extract of *Urtica dioica* leaves, *Res. J. Med. Plant.*, 2012, 6(2),123- 135.
21. Mehdi MA, Alawi AH, Thabet AZ, Alarabi F, Omar GM, Pradhan V. Analysis of bioactive chemical compounds of leaves extracts from Tamarindus indica using FT-IR and GC-MS spectroscopy. Asian Journal of Research in Biochemistry. 2021 Jan 14;8(1):22-34.
22. Karthik Y, Ishwara Kalyani M, Krishnappa S, Devappa R, Anjali Goud C, Ramakrishna K, Wani MA, Alkafafy M, Hussen Abduljabbar M, Alswat AS, Sayed SM. Antiproliferative activity of antimicrobial peptides and bioactive compounds from themangrove Glutamicibacter mysorens. Frontiers in Microbiology. 2023 Feb 17;14:1096826.
23. Khan S, Kaur H, Jhamta R. Evaluation of antioxidant potential and phytochemical characterization using GC-MS analysis of bioactive compounds of Achillea filipendulina (L.) leaves. Journal of Pharmacognosy and Phytochemistry. 2019;8(3):258-65.
24. Khatua S, Pandey A, Biswas SJ. Phytochemical evaluation and antimicrobial properties of Trichosanthes dioica root extract. Journal of Pharmacognosy and Phytochemistry. 2016;5(5):410-3.
25. Mary, F. P. A., and Giri, S.R.: GC-MS Analysis of bioactive compounds of *Achyranthes Aspera*. *World Journal of Pharmaceutical Research*;7(2018) 1045-1056.
26. Mladenovi M, MaškoviP et al. Studies on the antimicrobial activity and chemical composition of the essential oils and alcoholic extracts of Gentiana asclepiadea L., J Med Plant Res, 2011; 5(7): 1164-1174.
27. Mammen D, Daniel M, Sane RT. Seasonal and geographical variations in chemical constituents of Leptadenia reticulata. Int J Pharm Sci Rev Res. 2010;4(2):111-6.
28. Shawer EE, Sabae SZ, El-Gamal AD, Elsaied HE. Characterization of Bioactive Compounds with Antioxidant Activity and Antimicrobial Activity from Freshwater Cyanobacteria. Egyptian Journal of Chemistry. 2022 Sep 1;65(9):723-35.
29. R.C. Ohiri, E.B. Essien, Nutraceutical potentials of Turkey Tail medicinal mushroom, Trametes versicolor (Coriolus versicolor, yun zhi, kawaratake) (Agaricomycetes) from Nigeria, Pakistan J. Biochem. Mol. Biol. 50 (1) (2017) 1–6.
30. Naz R, Roberts TH, Bano A, Nosheen A, Yasmin H, Hassan MN, Keyani R, Ullah S, Khan W, Anwar Z. GC-MS analysis, antimicrobial, antioxidant, antilipoxygenase and cytotoxic activities of Jacaranda mimosifolia methanol leaf extracts and fractions. PLoS One. 2020 Jul 29;15(7):e0236319.
31. Chhabra D, Gupta RK. Fortification of curd using D. regia flower petal extract and estimation of its phytochemical, antibacterial & antioxidant activity. Journal of Pharmacognosy and Phytochemistry. 2015;4(3):299-307.