Available online on 30.08.2019 at http://jddtonline.info

Journal of Drug Delivery and Therapeutics

Open Access to Pharmaceutical and Medical Research

Open Access Research Article

Comparative Phytochemical Screening and Estimation of Bioactive Constituents of Leaves of *Lagerstroemia parviflora, Gardenia latifolia* and *Terminalia tomentosa*

Prabhakar Budholiya*[1], Hemant Kumar Sharma[2]

[1] Research Scholar, College of Pharmacy, Sri Satya Sai University of Technology & Medical Sciences, Sehore (M.P.)

[2] Professor & Dean, College of Pharmacy, Sri Satya Sai University of Technology & Medical Sciences, Sehore (M.P.)

ABSTRACT

Medicinal plants have bioactive compounds which are used for curing of various human diseases and also play an important role in healing. Secondary constituents contain alkaloids, flavonoids, phenol, saponin, steroids and tannins. Medicinal plants have anticancer, antimicrobial, antidiabetic, antidiuretic and anti-inflammation activities. The increasing interest in powerful biological activity of secondary metabolites outlined the necessity of determining their contents in medicinal plants. *Gardenia latifolia* (*G. latifolia* Rubiaceae) is commonly known as Indian boxwood or Ceylon boxwood, is a densely foliaceous small tree that occurs throughout the greater parts of Indian common in deciduous forests along the streams. The stem bark and fruits are reported to be used in the treatment of various ailments such as snake bite, skin diseases, stomach pains, caries in humans and ephemeral fever in live stocks. *Terminalia tomentosa* (*T. tomentosa* Combretaceae) occurs frequently in Indonesia, Malaysia, China and India as wasteland weed and also found in most parts of the world with a warm climate in dry, sandy and alkaline soils. The powdered leaves are useful for fast healing of wounds, as purgative, to treat liver problems, to promote sexual health, to relieve stomach ache, headache, also applied in sprain to ease swelling and pain. In Indian Ayurvedic system, *Lagerstroemia parviflora* (*L. parviflora,* Lythraceae) are well-known plants used for major and minor ailments. The aim of the present study is to examine leaf of *G. latifolia, T. tomentosa* and *L. parviflora* for phytochemical profile. Qualitative analysis of various phytochemical constituents and quantitative analysis of total phenolics and flavonoids were determined by the well-known test protocol available in the literature. Quantitative analysis of phenolic and flavonoids was carried out by Folins Ciocalteau reagent method and aluminium chloride method respectively. Phytochemical analysis revealed the presence of phenols, flavonoids, tannins, saponins, alkaloids, fixed oil and fats. The present study concluded that the crude extract of *G. latifolia, T. tomentosa* and *L. parviflora* is a rich source of secondary phytoconstituents which impart significant antioxidant potential. The findings of the present study will be helpful to phytochemists, pharmacologists and pharmaceutical industries.

Keywords: *Gardenia latifolia, Terminalia tomentosa, Lagerstroemia parviflora,* Phytochemical, Folins ciocalteau reagent

Article Info: Received 21 June 2019; Review Completed 17 Aug 2019; Accepted 28 Aug 2019; Available online 30 Aug 2019

Cite this article as:

Budholiya P, Sharma HK, Comparative Phytochemical Screening and Estimation of Bioactive Constituents of Leaves of *Lagerstroemia parviflora, Gardenia latifolia* and *Terminalia tomentosa*, Journal of Drug Delivery and Therapeutics. 2019; 9(4-A):674-678 http://dx.doi.org/10.22270/jddt.v9i4-A.3550

***Address for Correspondence:**

Prabhakar Budholiya, Research Scholar, College of Pharmacy, Sri Satya Sai University of Technology & Medical Sciences, Sehore (M.P.)

INTRODUCTION

Drugs from the plants are easily available, less expensive, safe and efficient and rarely have side effects[1]. According to World Health Organization (WHO), medicinal plants would be the best source to obtain variety of drugs. Large sections of the population in developing countries still rely on traditional practitioners and herbal medicines for their primary care[2]. Medicinal plants are plants in which one or more of their organs contain substances that can be used for therapeutic purposes or which are precursors for the synthesis of useful drugs. WHO consultative group that formulated this definition stated also that, such a description makes it possible to distinguish between medicinal plants whose therapeutic properties and constituents have been established scientifically and plants that are regarded as medicinal but which have not yet been subjected to a thorough scientific study[3]. Such plants should be investigated to better understand their properties, safety and efficacy. The medicinal properties of plants are due to some chemical constituents that produce certain pharmacological action on the humans. The qualitative analysis of phytochemicals of a medicinal plant is reported as vital step in any kind of medicinal plant research. Screening of plants constituents accurately can be done by employing chromatographic techniques[4]. Quantification usually employs the use of gravimetric and spectroscopic methods with several advanced approaches now available[5]. *G. latifolia* (Rubiaceae) is commonly known as Indian boxwood or Ceylon boxwood, is a densely foliaceous small tree or large shrub that occurs throughout the greater parts of Indian common in deciduous forests along the streams. Root used as a remedy for indigestion in children. Fruits used in affections of the mammary glands. Pounded pulp is

applied to forehead in fever. Stem and fruit used for stomach pain. Fruit extract is used in treating snake bite, sores of hand and feet, stomach ache and wounds. To treat caries, stem bark crushed and boiled in water is applied to affected areas. Bark is used in skin diseases. The bark and wood gave beta sestorol, hederegenin, Me-esters of oleanic and gypsogenic acids. Root gave gardenins. Saponins from bark decreased formation of histamine and may find use in asthma (market drug is expectorant and weak spasmolytic, but was not found effective in asthma). The stem bark contains hederagenin, D-mannitol, sitosterol and siaresinolic, episiaresinolic, oleanolic andspinosic acid[6,7]. *L. lanceolata* Wall. (Lythraceae) is a moderate to large deciduous tree, sometimes attaining 30 metres in height and 2.4 to 3.0 metres in girth with a clean cylindrical bole of 12 to 15 metres. It is found from Bombay to Kerala and in the hills of Deccan Peninsula upto an altitude of 1,200 metres. Bark is smooth, greenish or yellowish white, exfoliating in papery strips; leaves elliptic – lanceolate or broadly ovate, 6.2 to 10.0 cm x 1.8 to 5.0 cm, coriaceous, glabrous, shining above, usually white or grayish blue; flowers small, white, in large panicles; capsules ellipsoid; seeds winged[8]. *L. lanceolata* has been used in the treatment of asthma, diabetes mellitus, chronic bronchitis, cold and cough. Seeds have been documented for its multiple pharmacological activities including narcotic principle. Steroid, terpenoids, phenols, flavonoids, alkaloids, ellagic acid & tannins are the major components present in the plant[9]. *Mazumder et al.* (2003)[10] reported the antibacterial activities of the leaves of the plant and *Bhakuni et al.* (1969)[11] reported the antiasthmatic activity of the flowers of *L. parviflora*. The leaf juice of this plant is used in traditional medicine to treat fever in Jharkhand, India[12]. *T. tomentosa* (Combretaceae) is a large tree found in deciduous forests and extensively disseminated in south East Asian countries including India and Burma. Many plants of the genus *Terminalia* have been reported to possess medicinal values such as antidiabetic, cardioprotective, anti-inflammatory and antioxidant[13-16]. The common polypheolic compounds reported in many *Terminalia* species are: Ellagic acid, Dimethyl ellagic acid, Pentamethyl flavellagic acid, Trimethyl flavellagic acid and β-sitosterol[15]. Although, *T. tomentosa* bark is used in Indian traditional and folklore medicine for wound healing, GI disorders and anti-inflammatory purposes[17], it lacks adequate scientific evidences. Ramachandra Row and Subbarao (1962) reported the chemistry and constituents of *T. tomentosa* [18]. They isolated β-sitosterol, oleanolic acid, arjunolic acid, barringtogenol and tomentosic acid. Anjum Ghalaut *et al*. (2013)[19] developed and optimized a convenient, high throughput, and reliable UPLC-QTOFMS method to analyze crude water extract from *T. tomentosa*. They identified the presence of 5-Aminovaleric acid, Zeatin riboside, Thymine, 4-Methoxy cinnamic acid, Niacinamide, (-) Epigallocatechin, Indole-3-aldehyde, Resveratrol, Chlorogenic acid, (+)-Epicatechin, Quercetin-3-O-rhamnopyranoside, Quercetin and Kynurenic acid. The aim of this work was to determine the quality (types), quantity (amount) of bioactive compounds of leaf of *G. latifolia, T. tomentosa* and *L. parviflora*.

MATERIALS AND METHODS

Plant material

The leaves of *G. latifolia, T. tomentosa* and *L. parviflora* were collected from ruler area of Bhopal (M.P.) in the month of Feb, 2018. The leaves plant sample were separated and washed with sterile distilled water to remove the adhering dust particles and other unwanted materials. The leaf was air dried under room temperature. The dried plant samples were cut and grinded to make it in powder form.The powdered samples were stored in clean, dry and sterile container for further use.

Chemical reagents

All the chemicals used in this study were obtained from HiMedia Laboratories Pvt. Ltd. (Mumbai, India), Sigma Aldrich Chemical Co. (Milwaukee, WI, USA), SD Fine-Chem Ltd. (Mumbai, India) and SRL Pvt. Ltd. (Mumbai, India).All the chemicals used in this study were of analytical grade.

Extraction

Dried powdered leaf of *G. latifolia, T. tomentosa* and *L. parviflora* were successive extracted with various solvent (chloroform, ethyl acetate, methanol and aqueous) using maceration method. The extracts were evaporated above their boiling points and stored in an air tight container free from any contamination until it was used. Finally the percentage yields were calculated of the dried extracts[20].

Qualitative phytochemical analysis of plant extract

The *G. latifolia, T. tomentosa* and *L. parviflora* extracts obtained was subjected to the preliminary phytochemical analysis following standard methods by Khandelwal and Kokate[21,22] . The extract was screened to identify the presence or absence of various active principles like phenolic compounds, carbohydrates, flavonoids, glycosides, saponins, alkaloids, fats or fixed oils, protein and amino acid and tannins.

Total phenol determination

The total phenolic content was determined using the method of Olufunmiso *et al*[23]. A volume of 2ml of each extracts or standard was mixed with 1 ml of Folin Ciocalteau reagent (previously diluted with distilled water 1:10 v/v) and 1 ml (7.5g/l) of sodium carbonate. The mixture was allowed to stand for 15 min under room temperature. The colour developed was read at 765 nm using UV/visible spectrophotometer. The total phenolic content was calculated from the standard graph of gallic acid and the results were expressed as gallic acid equivalent (mg/100mg).

Total flavonoids determination

The total flavonoid content was determined using the method of Olufunmiso *et al*[23]. 1ml of 2% $AlCl_3$ methanolic solution was added to 3 ml of extract or standard and allowed to stand for 15 min at room temperature; the absorbance of the reaction mixture was measured at 420 nm using UV/visible spectrophotometer The content of flavonoids was calculated using standard graph of quercetin and the results were expressed as quercetin equivalent (mg/100mg).

RESULTS AND DISCUSSIONS

The crude extracts so obtained after each of the successive maceration extraction process were concentrated on water bath by evaporation the solvents completely to obtain the actual yield of extraction. The yield of extracts obtained from the leaves of the plants using chloroform, ethyl acetate, methanol and water as solvents are depicted in the Table 1.

Table 1 Results of percentage yield of leaf extracts

Plant Name	Percentage yield (%)			
	Chloroform	Ethyl acetate	Methanol	Water
G. latifolia	12.4	10.5	10.87	14
T. tomentosa	0.9	1.1	8.71	7.3
L. parviflora	1.8	3.5	8.21	9.6

The results of qualitative phytochemical analysis of the crude powder of leaf of *G. latifolia, T. tomentosa* and *L. parviflora* were shown in Table 2-4. Methanolic extracts of *G. latifolia, T. tomentosa* and *L. parviflora* showed the presence of glycosides, flavonoids, phenols, saponins, tannin and carbohydrate.

Table 2 Result of phytochemical screening of extracts of *L. parviflora*

S. No.	Constituents	Chloroform extract	Ethyl acetate extract	Methanol extract	Aqueous extract
1.	Alkaloids A) Wagner's Test: B) Hager's Test:	 -Ve -Ve	 -Ve -Ve	 -Ve +Ve	 -Ve -Ve
2.	Glycosides A) Legal's Test:	 -Ve	 -Ve	 +Ve	 +Ve
3.	Flavonoids A) Lead acetate Test: B) Alkaline Reagent Test:	 -Ve +Ve	 +Ve +Ve	 +Ve +Ve	 +Ve +Ve
4.	Saponins A) Froth Test:	 -Ve	 -Ve	 +Ve	 -Ve
5.	Phenolics A) Ferric Chloride Test:	 -Ve	 -Ve	 +Ve	 +Ve
6.	Proteins and Amino Acids A) Xanthoproteic Test:	 -Ve	 -Ve	 -Ve	 -Ve
7.	Carbohydrate A) Fehling's Test:	 -Ve	 -Ve	 +Ve	 -Ve
8.	Diterpenes A) Copper acetate Test:	 -Ve	 -Ve	 -Ve	 -Ve
9.	Tannin Gelatin test:	 -Ve	 -Ve	 +Ve	 +Ve

Table 3 Result of phytochemical screening of extracts of *G. latifolia*

S. No.	Constituents	Chloroform extract	Ethyl acetate extract	Methanol extract	Aqueous extract
1.	Alkaloids A) Wagner's Test: B) Hager's Test:	 -Ve +Ve	 -Ve -Ve	 -Ve -Ve	 -Ve -Ve
2.	Glycosides A) Legal's Test:	 -Ve	 -Ve	 +Ve	 -Ve
3.	Flavonoids A) Lead acetate Test: B) Alkaline Reagent Test:	 +Ve -Ve	 +Ve +Ve	 +Ve +Ve	 +Ve +Ve
4.	Saponins A) Froth Test:	 -Ve	 -Ve	 +Ve	 +Ve
5.	Phenolics A) Ferric Chloride Test:	 -Ve	 -Ve	 +Ve	 -Ve
6.	Proteins and Amino Acids A) Xanthoproteic Test:	 +Ve	 -Ve	 +Ve	 -Ve
7.	Carbohydrate A) Fehling's Test:	 -Ve	 -Ve	 +Ve	 -Ve
8.	Diterpenes A) Copper acetate Test:	 -Ve	 +Ve	 +Ve	 +Ve
9.	Tannin Gelatin test:	 -Ve	 -Ve	 -Ve	 -Ve

Table 4 Result of phytochemical screening of extracts of *T. tomentosa*

S. No.	Constituents	Chloroform extract	Ethyl acetate extract	Methanol extract	Aqueous extract
1.	Alkaloids A) Wagner's Test: B) Hager's Test:	 -Ve -Ve	 -Ve -Ve	 -Ve -Ve	 -Ve -Ve
2.	Glycosides A) Legal's Test:	 -Ve	 -Ve	 +Ve	 -Ve
3.	Flavonoids A) Lead acetate Test: B) Alkaline Reagent Test:	 -Ve -Ve	 -Ve -Ve	 +Ve +Ve	 +Ve +Ve
4.	Saponins A) Froth Test:	 -Ve	 -Ve	 +Ve	 -Ve
5.	Phenolics A) Ferric Chloride Test:	 -Ve	 -Ve	 +Ve	 -Ve
6.	Proteins and Amino Acids A) Xanthoproteic Test:	 -Ve	 -Ve	 -Ve	 -Ve
7.	Carbohydrate A) Fehling's Test:	 -Ve	 -Ve	 +Ve	 -Ve
8.	Diterpenes A) Copper acetate Test:	 -Ve	 -Ve	 -Ve	 -Ve
9.	Tannin Gelatin test:	 -Ve	 +Ve	 +Ve	 +Ve

The determination of the total phenolic content, expressed as mg gallic acid equivalents and per 100 mg dry weight of sample. The total flavonoids content of the extracts was expressed as percentage of quercetin equivalent per 100 mg dry weight of sample. TPC of methanolic extract of *G. latifolia, T. tomentosa* and *L. parviflora* showed the content values of 3.150, 3.860 and 4.900 respectively. The total flavonoid content of *G. latifolia, T. tomentosa* and *L. parviflora* methanolic extract showed the content values of 2.492, 3.928 and 3.685 respectively. Results are provided in (Table 5-7 and Fig. 1, 2).

Table 5 Estimation of total phenolic and flavonoids content of *L. parviflora*

S. No.	Extracts	Total phenolic content (mg/100mg of dried extract)	Total flavonoids content (mg/ 100 mg of dried extract)
1.	**Chloroform**	**-**	4.428
2.	**Ethyl Acetate**	-	4.342
3.	**Methanol**	4.900	3.685
4.	**Aqueous**	5.010	4.257

Table 6 Estimation of total phenolic and flavonoids content of *G. latifolia*

S. No.	Extracts	Total phenolic content (mg/100mg of dried extract)	Total flavonoids content (mg/ 100 mg of dried extract)
1.	**Chloroform**	**-**	4.350
2.	**Ethyl Acetate**	**-**	4.428
3.	**Methanol**	3.150	2.492
4.	**Aqueous**	-	2.542

Table 7 Estimation of total phenolic and flavonoids content of *T. tomentosa*

S. No.	Extracts	Total phenolic content (mg/100mg of dried extract)	Total flavonoids content (mg/ 100 mg of dried extract)
1.	**Methanol**	3.860	3.928
2.	**Aqueous**	-	1.521

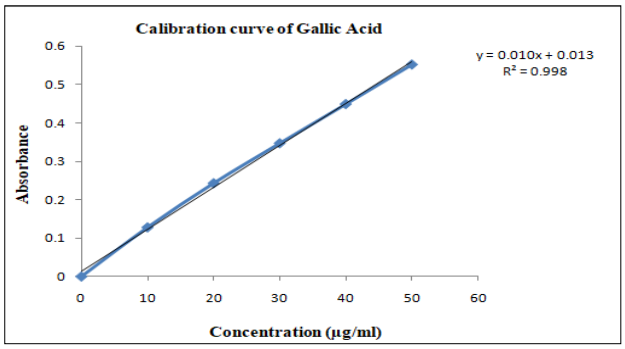

Figure 1 Graph of estimation of total phenolic content

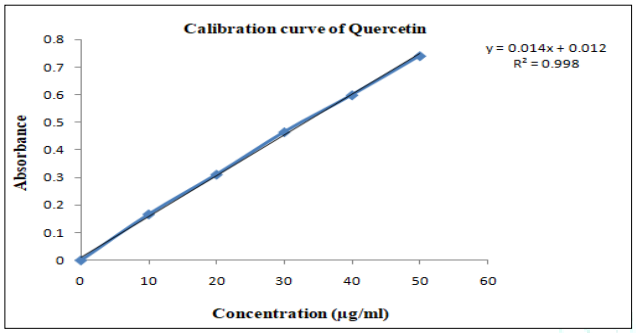

Figure 2 Graph of estimation of total flavonoid content

CONCLUSION

Qualitative and quantitative analysis of phenolics and flavonoids from leaves extract of *G. latifolia, T. tomentosa* and *L. parviflora* was achieved first time in this work. The observed level of phytoconstituents revealed that *G. latifolia, T. tomentosa* and *L. parviflora* is a rich source of antioxidant compounds. Currently available synthetic antioxidants are suspected to cause or prompt negative health effects, hence strong restrictions have been placed on their application and there is a trend to substitute them with naturally occurring antioxidants. Moreover, the plant parts may be used as an alternative source for flavonoids and phenols for traditional remedies. Further phytochemical studies are also required to isolate and characterize active ingredients that are responsible for its antioxidant and others activity and to explore the existence of synergism if any, among the compounds.

ACKNOWLEDGMENTS

The authors would like to thank the Mr. Prabhat Kumar Jain, Geeta Parkhe and All supporting staff of Scan Research Laboratories, Bhopal (M.P.) who helped in the experiments during research work.

REFERENCES

1. Yadav RNS, Agarwala M. Phytochemical analysis of some medicinal plants. J Phytology 2011; 3(12):10-14.
2. WHO. Traditional medicine-growing needs and potentials. WHO Policy Perspectives Med, 2002.
3. WHO. Traditional Medicine and Modern Health Care Progress Report by the Direct General World Health Organization, Document No A-144110, 1991.
4. Sneader W, The discovery of aspirin: A reappraisal, BMJ (Clinical research ed., 2000; 321(7276):1591-1594.
5. Aguoru CU, Ameh SJ, Olasan O. Comparative phyochemical studies on the presence and quantification of various bioactive compounds in the three major organs of okoho plant (cissus popunea guill & perr) in Benue State, North Central Nigeria, West Africa. European J Adv Res Biol Life Sci 2014; 2(2):16-22.
6. Ray AS, Rahaman CH. Pharmacognostic, Phytochemical and Antioxidant Studies of Gardenia latifolia Aiton: An Ethnomedicinal Tree Plant. Int J Pharmacog Phytochem Res 2018; 10(5):216-228
7. Tamilselvi K, Ananad SP, Doss A. Evaluation of In-Vitro Antidiabetic Activity of Gardenia Latifolia Ait. Int J Health Sci Res 2018; 8: 226-230.
8. Marg KK. National institute of science communication and information resources. DIO. 2016 25:01-1993.
9. Bhusnure OG, Alagawadi KR, Giram PS, Poul BN. Study of analgesic and anti- inflammatory activities of *Lagerstroemia lanceolata* Wall seed extract. Int J Pharm& Clin Res 2009; 1(3): 127-130
10. Mazumder A, Saha BP, Basu SP, Mazumder R. Antibacterial activity of methanolic extract of leaves of Lagerstroemia parviflora. Indian J Nat Prod 2003; 19: 20-24.
11. Bhakuni DS, Dhar ML, Dhar MM, Dhawan BN, Mehrotra BN. Screening of Indian plants for biological activity. Part II. Ind J Exp Biol1969; 7: 250-256.
12. Jain SK, Tarafdar CR .Medicinal plant-Lore of the santals. Econ Bot1970; 24: 241-243.
13. Anjaneyulu ASR, Reddy AVR, Mallavarapu GR. Chandrasekara RS. 3-acetyl maslinic acid from the root bark of *Terminalia alata*. Phytochemistry 1986; 25:2670-71.
14. Kapoor D, Vijayvergiya R, Dhawan V. *Terminalia arjuna* in coronary artery disease: ethanopharmacology, pre-clinical, clinical and safety evaluation. J Ethanopharmacol 2014; 155:1029-45.
15. Mopuri R, Ganjayi M, Banavathy KS, Parim BN, Meriga B. Evaluation of antiobesity activities of ethanolic fraction of *Terminalia paniculata* bark on high fat diet induced obese rats. BMC Complement Altern Med 2015; 15:76.
16. Fahmy NM, Al-Sayed E, Abdel-Daim MM, Karonen M, Singab AN. Protective effect of *Terminalia muelleri* against carbon tetrachloride induced and nephrotoxicity in mice and characterization of its bioactive constituents. Pharm Biol 2016; 54:303-13.
17. Ellman GL. Tissue sulfhydryl groups. Arch Biochem Biophys 1959; 82:70-77.
18. Row LR, Rao GSRS. Chemistry of Terminalia species-VI: The constitution of tomentosic acid, a new triterpene carboxylic acid from *Terminalia tomentosa* wight et arn. Tetrahedron 1962; 18:827-38.
19. Gahlaut A, Sharma A, Shirolkar A, Dabur R. Non-targeted identification of compounds from regenerated bark of *Terminalia tomentosa* by HPLC-(D) ESI-QTOFMS. J Phar Res 2013; 6:415-18.
20. Mukherjee PK. Quality control of herbal drugs. 2nd Ed. Business Horizons; 2007.
21. Khandelwal KR, Practical pharmacognosy technique and experiments. 23rd Ed. Nirali Prakashan; 2005.
22. Kokate CK. Practical pharmacognosy. 4th Ed. Vallabh Prakashan; 1994.
23. Olufunmiso OO, Afolayan AJ, Phenolic content and antioxidant property of the bark extract of *Ziziphus mucronata* willd. Subsp. mucronata willd, BMC Comp Alter Med 2011; 11:130.