

**ETHNOBOTANICAL, PHYTOCHEMICAL AND *IN VITRO*  
ANTIOXIDANT ACTIVITY OF MEDICINAL PLANT *GARDENIA*  
*GUMMIFERA* Linn. F. (RUBIACEAE) FROM ATTAPPADY,  
PALAKKAD DISTRICT, KERALA**

**S Manorama\* and S Sindhu**

PG and Research Dept. of Botany, Kongunadu Arts and Science College (Autonomous),  
Coimbatore-29, Tamilnadu, India

Article Received on  
20 August 2013,

Revised on 26 Sept. 2013,  
Accepted on 31 October 2013

**\*Correspondence for  
Author:**

**Dr. S Manorama**

PG and Research Dept. of  
Botany, Kongunadu Arts and  
Science College (Autonomous)  
Coimbatore-29, Tamilnadu,  
India.

[drsmanorama@gmail.com](mailto:drsmanorama@gmail.com)

[s.sindhu389@gmail.com](mailto:s.sindhu389@gmail.com)

**ABSTRACT**

An ethnobotanical survey in Attappady, Palakkad District, Kerala have revealed a wealth of traditional knowledge on medicinal plants and their uses amongst the local healers. The indigenous knowledge of local traditional healers and the native plants used for medicinal purposes were collected through questionnaire and personal interviews during field trips. Phytochemical evaluation of the leaves of *Gardenia gummifera*, most prominent in the recipes indicated the presence of tannins, flavonoid, alkaloid, flavonoid, quinines, glycosides, cardiac glycosides, terpenoids, phenols, steroids, phytosteroids, fats, gum, mucilage and phytosterol while saponin, carbohydrate, coumarin and proteins were absent. The further investigation of the potentially active constituents of *G.gummifera* should provide new potential medicines for the phytotherapeutic arsenal.

**Key words:** Ethnobotanical survey, Attappady, *Gardenia gummifera*, Phytochemical.

**INTRODUCTION**

Ethnobotany is a multidisciplinary science defined as the interaction between plants and people. The relationship between plants and human cultures is not limited to the use of plants for food, clothing and shelter but also includes their use for religious ceremonies, ornamentation and health care<sup>1</sup>.

The plants used in ethnomedicine contain a wide range of substances that can be used to treat chronic as well as infectious disease. They are rich in secondary metabolites and essential oils of therapeutic importance. The advantages claimed for therapeutic uses of medicinal plants in various ailments are their safety besides being economical, effective and their easy availability. Moreover it is an undeniable fact that the knowledge of indigenous people is invaluable in the present context of biodiversity for its sustainable utilization and novel drug development programs.

The present ethnobotanical study has been conducted in Agali, Mukkali and Anavay villages of Attappady hills, Palakkad district. *Gardenia gummifera* Linn belongs to the family Rubiaceae, is a large medicinal tree with resinous bud. The plant is common and occurs in all habitats. The leaf extract of *Gardenia gummifera* is used against kapha, skin disease, indigestion and worm infestation. The resin is acrid, bitter, thermogenic, cardiogenic, carminative, antispasmodic, stimulant, diaphoretic, antihelmintic, antiseptic and expectorant. It is traditionally used in conditions of cardiac debility, obesity, lipolytic disorders, bronchitis, neuropathy and splenomegaly and is given to children in nervous disorders and diarrhoea due to dentition<sup>2</sup>. Therefore, the present investigation was undertaken to document the ethnomedicinal plants used by the tribals in the study area and to screen the preliminary phytoconstituent and *invitro* antioxidant activity from the selected plant.

## MATERIALS AND METHODS

### STUDY AREA

Attappadi is one of the prominent tribal regions of Kerala with abundant vegetation and extensive forest. The study areas Agali, Mukkali and Anavay are small villages in Attappadi block of Palakkad district, Kerala. The hills are bordered to the East by Coimbatore district in Tamilnadu, on the North by the Nilgiris, south by Mannarkkad taluk and west by Palakkad and Malappuram districts at 10°55' - 11°15'N latitude and 76°21' - 76°8'E longitude. The mean sea level of study area ranges between from 450 and 2300m msl.

The area is tropical in climate and vegetation is characterized by "Moist evergreen forest of the slopes and at low elevation" and shrub savanna called Sholas. The study area receives rain fall during the south west monsoon (June-September), it constitutes about 70% of the annual rainfall. Average annual rainfall is 5440mm.

### **Ethnobotanical study**

The ethnobotanical surveys were carried out during the period of December 2012 to February 2013 for documentation of information and collection of plant material. A detailed survey was carried out in the villages namely Agali, Mukkali and Annavey in Attappadi hills. This study is based on an independent field investigation among the Mudhuga, Irula and Kurumba employing mainly methods of participants, observation and unstructured interviews. The field visit was conducted many times to the study area.

Ethnobotanical data was collected according to the methodology suggested by Jain<sup>3</sup>, through questionnaire, interviews and discussions among tribal practitioners in their local language. Very famous traditional healers and other versatility people of each area were interviewed to document detailed information on local names, folklore plants, plant parts used and all other kinds of details offered by the informants. Local names, useful plant parts, methods of preparation and dosage were recorded. Identification and nomenclature of the collected plants were done based on the Flora of Presidency of Madras<sup>4</sup> and confirmed in the herbarium of Department of Botany, Kongunadu Arts and Science College, Coimbatore. Data are tabulated with plant name along with family, local name, parts used and utility.

### **PLANT MATERIALS**

Different parts of stem of *Gardenia gummifera* were collected during Nov 2012 from Attappadi, Palakkad District, Kerala, India. With the help of local flora, a voucher specimen was retained in the Department of Botany, Kongunadu Arts and Science College, Coimbatore, Tamil Nadu for further reference.

### **EXTRACTION OF PLANT MATERIAL**

Various organic solvents (acetone, ethanol and aqueous) were used for the extraction of bioactive compounds. The shade dried powdered plant material was subjected to aqueous, acetone and ethanolic extraction by cold extraction methods. The extracts obtained were completely evaporated using rotary vacuum evaporator. The concentrated extracts were used for phytochemical and antioxidant activity.

### **Qualitative phytochemical analysis**

The phytochemical screening of the samples such as alkaloids, steroids and saponins were carried out as described by Sofowora and Harbone<sup>5,6</sup>.

### Total Phenolic Content

The total phenolic content of the extract was determined using the method of Macdonald *et al.*<sup>7</sup> with slight modifications. Absorbance values were measured at 765 nm and the standard curve was drawn after an incubation of 40 minutes in dark to determine the total phenolic content. All determinations were carried out in triplicate. The total phenolic content in the extract were presented as mg Gallic Acid Equivalents (GAE)/ g extract.

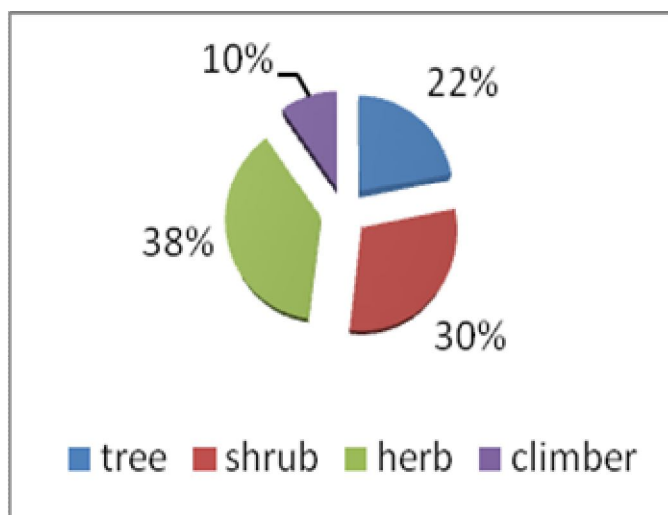
### DPPH• scavenging activity

DPPH (1,1-diphenyl-2-picryl hydrazine) free radical-scavenging capabilities of methanolic extracts were evaluated by the method of Blois<sup>8</sup>. Briefly, different concentrations (50, 100, 150, 200 and 250 mg/ml) of the extracts were pipetted out to the test tubes. 100 µL of 0.2 mM alcoholic DPPH solution was added to the samples. These samples were vortexed, and incubated in dark at room temperature for 30 min. The absorbance was measured at 517 nm against blank samples. Decreased absorbance of the sample indicates DPPH• free radical scavenging capability<sup>9,10</sup>.

## RESULTS AND DISCUSSION

The traditional knowledge system in India is fast disappearing. So there is an urgent need for inventorying and recording all ethnobotanical information among the diverse ethnic communities. The results of the ethnobotanical survey are presented in Table 3. The study revealed 50 ethnomedicinal plant species distributed in 32 different families that are frequently used for the treatment of various ailments. In this study, members of the family Meliaceae, Rubiaceae, Asteraceae, Acanthaceae, Verbanaceae and Liliaceae (three species) were the most commonly used plants for the treatment of various diseases. Other families were Anacardiaceae, Leguminosae, Euphorbiaceae and Zingiberaceae (two species), while other had one species each.

Balasubramanian and Narenndra Prasad<sup>11</sup> enumerated the medicinal plants among the Irula of Attappady. This area was also observed by Binu *et al.*<sup>12</sup> in which they enumerated 40 medicinal plant species belonging to 23 families used as medicine by the Irula of Palakkad district, Kerala.



**Fig 1: Life forms**

Herbs (38% species) were found to be the most used plants followed by shrubs (30% species), trees (22% species) and climbers (10% species) in descending order (Fig 1). The qualitative analysis of secondary metabolites using the crude leaf of *Gardenia gummifera* in acetone and ethanolic extracts confirmed the presence of tannins, saponin, flavonoid, alkaloid, flavonoid, quinines, glycosides, cardiac glycosides, terpenoids, phenols, steroids, phytosteroids, fats, gum, mucilage and phytosterol. (Table 1). The total phenolic content of *Gardenia gummifera* is higher in water extract than that of other two solvent systems viz., ethanol and acetone. In similar lines the free radical scavenging activity of *Gardenia gummifera* water leaf extract ( $1.74 \pm 4.90$ ) is much higher than that of ethanolic ( $1.61 \pm 0.15$ ) acetone extracts ( $0.23 \pm 0.05$ ) (Table 2).

**Table 1: Qualitative phytochemical analysis of *Gardenia gummifera* leaf extract.**

Phytochemical test	Acetone	Ethanol
Carbohydrate	-	-
Tannin	+	+
Saponin	-	+
Flavonoid	+	+
Alkaloid	+	+
Quinones	+	+
Glycosides	+	+
Cardiac glycosides	+	+

Terpinoid	+	+
Phenols	+	+
Coumarins	-	+
Acids	-	+
Proteins	-	+
Steroids	+	+
Phytosteroids	+	+
Phlobatannin	-	-
Fat	+	+
Gum and Musilage	+	+
Phytosterol	+	+

+ Presence and - Absence

**Table 2: Total phenolics and DPPH activity of *Gardenia gummifera* in various extracts.**

Plant part used	Total phenolics(GAE/g of sample)	DPPH (IC <sub>50</sub> value)
LA	0.23±0.05	234.61±7.2
LE	1.61±0.15	206±5.6
LW	1.74±4.90	39.87±4.90

LA - Leaf Acetone, LE – Leaf Ethanol and LW – Leaf Water Extracts

Table 1: Ethanobotanical data of collected plants

S.No.	Botanical name	Family	Local name	Habit	Parts used	Ailments treated
1.	<i>Tinospora cordifolia</i> . Miers	Menispermaceae	Chittamruthe	Climber	Leaf, stem	Skin disease
2.	<i>Biophytum sensitivum</i> (L) DC	Oxalidaceae	Mukkutty	Herb	Leaf	Wound healing, burns
3.	<i>Citrus limon</i> Linn.	Rutaceae	Naranga	Shrub	Bark	Skin disorder, shingles and eczema
4.	<i>Naregamia alata</i> W&A	Meliaceae	Nila naragam	Herb	Whole plant	Itch and contagious skin disorder
5.	<i>Azadirachta indica</i> Adr.juss	Meliaceae	Veppu	Tree	Whole plant	Scar and pulps of body
6.	<i>Cipadessa baccifera</i> (Roth). miq	Meliaceae	Seeruholimaram	Shrub	Root, leaf and bark	Psoriasis
7.	<i>Mangifera indica</i> Linn.	Anacardiaceae	Mavu	Tree	Stem extract	Scorpion bites and Psoriasis
8.	<i>Anacardium occidentale</i> Linn.	Anacardiaceae	Parankimavu	Tree	Old leaf	Skin afflicaton and burns
9.	<i>Moringa oleifera</i> Bark.	Moringaceae	Muringa	Tree	Leaves, fruit	Anti-inflammatory
10.	<i>Hibiscus rosa sinensis</i> Linn.	Malvaceae	Chemparathi	Shrub	Flower	Cellulite
11.	<i>Crotalaria pallida</i> Aiton	Leguminosae	Kilukiluki	Herb	Leaf	Skin disease
12.	<i>Indigofera aspalathoides</i> Vabl.	Leguminosae	Sivanarvembu	Shrub	Whole plant	Psoriasis

13.	<i>Lowsonia inermis</i> Linn.	Lyraceae	Mylandhi	Shrub	Leaf	Itching
14.	<i>Cucurbita maxima</i> Duch.	Cucurbitaceae	Mathanga	Climber	Seed	Skin problems, wound healing and burns
15.	<i>Terminalia bellerica</i> Roxb.	Combretaceae	Thanthimaran	Tree	Bark, root	unnecessary peeling of skin
16.	<i>Centella asiatica</i> Linn.	Apiaceae	Kudangal	Herb	Whole plant	Skin diseases, scorpion bites and improves memory power
17.	<i>Catunaregam spinosa</i> (Thunb.) Tirveng.	Rubiaceae	Kara	Tree	Bark	Scabies and Leach repellent
18.	<i>Gardenia gummiifera</i> Linn. F.	Rubiaceae	Kambi	Tree	Leaf and resin	Skin disease and burns
19.	<i>Ixora coccinea</i> Linn.	Rubiaceae	Thechi	Shrub	Flower	scabies, enzema and skin infection
20.	<i>Chromolaena odorata</i> (L). King	Asteraceae	Communist chedi	Shrub	Leaves	wound healing
21.	<i>Vernonia cinera</i> Less	Asteraceae	Poovam kurunnila	Herb	Leaves	Skin problems
22.	<i>Tridax procumbance</i> Linn.	Asteraceae	Vettupaku	Herb	Leaves	Wound healing
23.	<i>Plumbago zeylanica</i> Sp.pl	Plumbaginaceae	Vellakoduveli	Shrub	Leaves and roots	Acro-narcotic poison and skin problem
24.	<i>Rauvolfia serpentine</i>	Apocynaceae	Sarpaghandhi	Shrub	Whole plant	Skin problem



	Benth. Ex Kurz					
25.	<i>Alstonia scholaris</i> R.Br	Apocynaceae	Pala	Tree	Bark	Skin louse
26.	<i>Strychnos nux vomica</i> L	Loganiaceae	Ettikancharan	Tree	Root	Skin wounds
27.	<i>Solanum lycopersicum</i> Linn.	Solanaceae	Thakkali	Herb	Fruit	Skin disease
28.	<i>Ipomea sepiaria</i> Koen	Convolvulaceae	Thalikeerai	Climber	Leaf and root	Skin infection
29.	<i>Adhatoda vasica</i> Nees.	Acanthaceae	Adalotakam	Shrub	Roots	Scabis and wound healing
30.	<i>Barleria prionitis</i> Linn	Acanthaceae	Kanimalar kurungi	Shrub	Leaf	Maceration and cracking
31.	<i>Justicia simplex</i> D	Acanthaceae	Kariyat	Herb	Leaf	Skin infection
32.	<i>Lantana whitiana</i> Roxb.	Verbanaceae	Vella unnichedi	Shrub	Leaf	Psoriasis
33.	<i>Lantana camara</i> Linn.	Verbanaceae	Unnichedi	Shrub	Leaf	Eczema and skin itches
34.	<i>Stachyterpheta indica</i> Vahl.	Verbanaceae	Neerpanai	Herb	Leaf and stem	Allergies and skin wounds
35.	<i>Leucas aspera</i> (Willd) Link	Lamiaceae	Thrumba	Herb	Leaf	Skin itches and swellings
36.	<i>Osmium sanctum</i> Linn.	Lamiaceae	Thulasi	Shrub	Leaf	Parasitical skin disease
37.	<i>Aristolochia indica</i> Linn.	Aristolochaceae	Mudhulaikodi	Twiner	Leaf	Skin wounds
38.	<i>Santalum album</i> Linn.	Santalaceae	Chandanam	Tree	Heart wood and root	Eczema
39.	<i>Boerhavia diffusa</i> L.	Nyctaginaceae	Thazhuthama	Herb	Whole plant	Scabies and anaemia
40.	<i>Achyranthus aspera</i> L.	Amarathaceae	Urumuli	Herb	Leaf	Skin problem

41.	<i>Piper betle</i> Linn.	Piperaceae	Vettila	Creeper	Leaf	Wound healing
42.	<i>Sreblus asper</i> Lour	Moraceae	Kembara	Tree	Leaf	Skin swellings
43.	<i>Euphorbia hirta</i> L.Sp.Pl	Euphorbiaceae	Amman pacharasi	Herb	Whole plant	Skin disease
44.	<i>Sebastiania chamaelea</i> Muell.Arg	Euphorbiaceae	Chulli	Herb	Leaf	Skin itches
45.	<i>Curcuma longa</i> Linn	Zingiberaceae	Manjal	Herb	Rhizome	Skin glow and wound healing
46.	<i>Curcuma aromatic</i> Salisb	Zingiberaceae	Kasturi manjal	Herb	Rhizome	Skin disease, sprain, bruises and wound healing
47.	<i>Gloriosa superb</i> L.Sp.Pl	Liliaceae	Methonni	Herb	Leaf	Pimples, skin eruptions, leprosy skin infections
48.	<i>Aloe vera</i> (L) Burm	Liliaceae	Chottu kathalai	Herb	Leaf and root	Skin disease, leprosy, jaundice, menstrual problem and joint pains
49.	<i>Asparagus recemous</i> Willd	Liliaceae	Satavari	Climber	Leaf and root	Burning sensation
50.	<i>Cyperus rotundus</i> Linn.	Cyperaceae	Muthanga	Herb	Rhizome	Skin itches, scabies and eczema.

## CONCLUSION

The plant extractive study could be an answer to the people seeking for better therapeutic agents from natural sources. It is believed to be more efficient with little or no side effects when compared to the commonly used synthetic chemotherapeutic agents. The present study verified the traditional use of *Gardenia gummifera* for human ailments and partly explained its use in herbal medicine as rich source of phytochemical and antioxidants. Thus this plant can be used as a alternative source of useful drug.

## REFERENCE

1. Schultes RE. Ethnobotany and technology in the Northwest Amazon: A partnership. In Sustainable harvest and marketing of rain forest products, Eds. Plotkin and Famolare, Island Press, CA, 1992 pp: 45-76.
2. Varier PS. Indian medicinal plants-a compendium of 500 species. Madras: Orient Longman Publications 1995.p.65-68.
3. Jain SK. The role of botanist in folklore research. *Folklore* 5(4), 1964, 145-150.
4. Gamble JS. Flora of Presidency of Madras. Vol. i-iii. Adlard & Co., London. 1915-1935.
5. Sofowara A. Medicinal plants and Traditional medicine in Africa. Spectrum Books Ltd, Ibadan, Nigeria, 1993 pp: 289. pp: 1-3.
6. Harbone JB. Phytochemical Methods: A Guide to Modern Technique of Plant Analysis, 2nd ed. Chapman and Hall: New York, NY. 1973.
7. McDonald S, Prenzler PD, Autolovich M, Robards K. Phenolic content and antioxidant activity of olive oil extracts. *Food Chem.* 2001; 73:73-84.
8. Blois MS. Antioxidant determinations by the use of a stable free radical. *Nature* 1958; 26.
9. Gulcin I, Beydemir \_\_, Alici HA, Elmasta\_ M, Buyukokuro\_lu ME. *In vitro* antioxidant properties of morphine. *Pharmacol. Res.* 2004a; 49: 59- 66.
10. Gulcin \_\_, Mshvildadze V, Gepdiremen A, Elias R. Antioxidant activity of saponins isolated from ivy: a-Hederin, hederasaponin-C, hederacolchiside-E and hederacolchiside F. *Planta Med.* 2004b; 70: 561- 563.
11. Balasubramanian P, Rajasekaran A, Prasad SN. Folk medicine of the Irulas of Coimbatore forests. *Ancient Science of Life* , 1996; xvi 3, 222-226.
12. Binu S, Shanavaskhan AE, Santhoshkumar ES, Pushpangadan P. Plants district, Kerala, India. *J.Econ. Taxon. Bot.*, 27(4), 2003, 808-814.