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Pharmacognostic, phytochemical and antibacterial studies on *Jasminum auriculatum*

Sucharitha P A M^{1*}, Madhu bindu M², U Salma S, R Mymuna S, Padmavathi P, Mansoor A K S.P, V Ramana P

¹Department of Pharmacognosy, PRRM College of Pharmacy, Kadapa, Andhra Pradesh, India.

*Corresponding Author: P. A. M. Sucharitha
Email: sucharithaniranjan@gmail.com

ABSTRACT

Jasmine is a genus of shrubs and vines in the olive family Oleaceae with about 200 species throughout the world, out of which around 40 species are reported to be growing in India. Irrespective of the species, extracts from different parts such as leaves, stem, bark and roots of the *Jasminum* plants have been used in ethno-medicines for a long time. The aim of the present study is to screen the plant material for phytochemical constituents and antibacterial activity. An antimicrobial is a substance that kills or inhibits the growth of microorganisms such as bacteria, fungi or protozoans as well as destroying viruses. Antimicrobial drugs either kill microbes (microbicidal) or prevent the growth of microbes (microbisttic). *Jasminum auriculatum* is an evergreen shrub; native to Deccan Peninsula, Circars and Carnatic extending south wards to Travancore. The present study on pharmacognostical characteristic of *Jasminum auriculatum* provide useful information for its correct identity and help to differentiate from the closely related other species. Strains of bacteria *Streptomyces aureus* and *Escherichia coli* have been used for the study. The ethanolic extracts were used to find antibacterial activity by disc plate method and are showing very good reaction for carbohydrates, alkaloids, volatile oils, flavanoids, tannins, saponins, fats and oils and amino acids. This may be the reason for the very good antibacterial activity.

Keywords: *Jasminum auriculatum*, Ethanolic extract, Antibacterial activity, *Streptomyces aureus*, *Escherichia coli*, Disc plate method, Flavanoids, Tannins

INTRODUCTION

The term “**medicinal plant**” includes various types of plants used in herbalism (“herbology” or “herbal medicine”). It is the use of plants for medicinal purposes and the study of such uses.

The word “**herb**” has been derived from the Latin word, “*herba*” and an old French word “*herbe*”. Nowadays, herb refers to any part of the plant like fruit, seed, stem, bark, flower, leaf, stigma or a root, as well as a non-woody plant. Earlier, the term “herb” was only applied to non-woody plants, including those that come from trees

and shrubs. These medicinal plants are also used as food, flavoring, medicine or perfume and also in certain spiritual activities. [1]

Herbals for human health and diseases

Ancient people were fully aware of the rich potential of herbs for curing different types of ailments. The practice of herbal medicine has existed since prehistoric times as the primary form of medicine. Among ancient civilizations, India has been known to be rich repository of medicinal plants. The forest in India is the principal repository of large number of medicinal and aromatic plants, which are largely collected as raw materials for manufacture of drugs and perfumery products. About 8,000 herbal remedies have been codified in AYUSH systems in INDIA. Ayurveda, Unani, Siddha and Folk (tribal) medicines are the major systems of indigenous medicines. Among these systems, Ayurveda and Unani Medicine are most developed and widely practiced in India

Treatment with medicinal plants is considered very safe as there is no or minimal side effects.

These remedies are in sync with nature, which is the biggest advantage. The golden fact is that, use of herbal treatments is independent of any age groups and the sexes. [3]

Traditional Medicine

By definition, ‘traditional’ use of herbal medicines implies substantial historical use, and this is certainly true for many products that are available as ‘traditional herbal medicines’. In many developing countries, a large proportion of the population relies on traditional practitioners and their armamentarium of medicinal plants in order to meet health care needs.

Plant based drugs and medicines

Today there are at least 120 distinct chemical substances derived from plants that are considered as important drugs currently in use in one or more countries in the world. The original plant substance/chemical name is shown under the “Drug” column rather than the finished patented drug name.

Table: 1.3.1 Plant based drugs used to treat diseases

Drug/chemical	Action /clinical use	Plant source
Ajmalicine	Circulatory disorders	Rauwolfia serpentine
Codeine	Analgesic, Antitussive	Papaver somniferum
Emetine	Amoebicide, emetic	Cephaelis ipecacaunha
Nicotine	Insecticide	Nicotiana tobacum

Therapeutic Uses of Herbs

A plant’s leaves flowers, stems, berries, seeds, fruit, bark, roots or any other part may be used for medical purpose. Most herbal remedies are used to treat minor health problems, such as nausea, colds, cough, flu, headache, aches and pains, stomach and intestinal disorders, menstrual cramps, insomnia, skin disorder, and dandruff. Some herbalists have reported success in treating certain chronic conditions including peptic ulcers, inflammation on colon, rheumatoid arthritis, high blood pressure, and respiratory problems. Some use herbal remedies for illnesses usually treated only with prescriptions drugs, such as heart failure.

Commercial Cultivation of Plants in India Useful for Modern Medicines

More than 100 medical plants are used in modern medicines. Plants used in traditional system of medicines are over 500 different types. Most of raw materials for traditional medicine pharmaceutical house are collected from wild source. Many of medicinal plants are cultivated commercially nowadays for extraction of some important active constituents for use in modern medicine.

Jasmine

Jasmine is a genus of shrubs and vines in the olive family Oleaceae with about 200 species throughout the world, out of which around 40 species are reported to be growing in India [7]. Irrespective of the

species, extracts from different parts such as leaves, stem, bark and roots of the *Jasminum* plant have been used in ethno-medicines for a long time.

Antimicrobial

An antimicrobial is a substance that kills or inhibits the growth of microorganisms such as bacteria, fungi, or protozoans, as well as destroying viruses. Antimicrobial drugs either kill microbes (microbicidal) or prevent the growth of microbes (microbisttic). The history of antimicrobials begins with the observations of Pasteur and Joubert, who discovered that one type of bacteria could prevent the growth of another. The term antibiotic is used to refer to almost any drug that cures a bacterial Infection. Antimicrobials include not just antibiotics, but synthetically formed compounds as well. The discovery of antimicrobials like penicillin and tetracycline paved that way for better health for millions around the world.

Antibacterial activity

The science dealing with the study of the prevention and treatment of diseases caused by micro-organisms is known as medical microbiology.

Mode of Action

Antimicrobial drugs interfere chemically with the synthesis of function of vital components of micro organisms, the cellular structure and functions of eukaryotic cells of the human body. These differences provide us with selective toxicity of chemotherapeutic agents against bacteria. Antimicrobial drugs may either kill microorganisms outright or simply prevent their growth. There are various ways in which these agents exhibit their antimicrobial activity^[8] They may inhibit^[9]

- (1) Cell-wall synthesis
- (2) Protein synthesis
- (3) Nucleic acid synthesis
- (4) Enzymatic activity
- (5) Folate metabolism or
- (6) Damage cytoplasmic membrane

Plant profile

Botanical name: *Jasminum auriculatum*

Synonyms: *jasminum mucronatum*, *jasminum ovalifolium*

Family: *oleaceae*

Vernacular Names in India: [10, 11, 12]

Telugu- Adavimolla
Tamil- Usimalli
Sanskrit- Yoothika
Hindi- Juhi

Scientific classification: [13]

Kingdom Plantae
Class Magnoliopsida- Dicotyledons
Order Scrophulariales
Family Oleaceae
Genus *Jasminum- jasmine*
Species *Auriculatumuah*

Geographical distribution

Jasminum auriculatum is an evergreen shrub; native to Deccan Peninsula, Circars and Carnatic extending south wards to Travancore. It is commercially cultivated for its fragrant flowers mainly in Ghazipur, Jaunpur, Farrukhabad and Kanauj districts of U.P, Bihar and Bengal [14]. It is also found in Nepal, Srilanka, E.Asia, Thailand. In India it is also cultivated in Karnataka, Tamilnadu, Andhra Pradesh.

Morphological Features of *Jasminum auriculatum*

Juhi is a beautiful flower with extremely heavy gardenia type scent. This species is not very common though it deserves a special attention. It is a stunning, small climbing bushy plant with simple ovate dark green small leaves and powdery satin white flowers. Leaves are opposite, ashy-velvety, sometimes hairless, simple or trifoliolate. Lateral leaflets are much smaller, rarely exceeding 4 mm in diameter, the central one up to 3.5 cm long and 1.5 cm broad, ovate, shortly pointed. Nerves are few, lowest oblique. Bracts are linear, 4 mm long. Flowers are fragrant, in many-flowered cymes. Flower-stalks are up to 5 mm long. Calyx 3 mm long, pubescent, teeth minute. Flowers are white, tube 1.5 cm long, lobes elliptic, up to 8 mm long. Berry is 5 mm in diameter, globose, black. The flower is held sacred to all forms of Goddess Devi and is used as sacred offerings during Hindu religious ceremonies [15].



Figure3.1: *Jasminum auriculatum*

Microscopy

The leaflet is dorsiventral with upper layer of epidermis having barrel shaped cells. It is covered with very thin cuticle and contains no stomata but the lower epidermis has paracytic stomata. Both the epidermis has glandular and covering trichomes. Glandular trichomes have 1-2 celled stalks with 4-8 celled head. The covering trichomes are warty, multicellular, uniseriate type.

Below the upper epidermis the laminar region has 1-2 layers of palisade cells. These cells have microrosette crystal of calcium oxalate. Palisade is followed by 2-3 layers of spongy parenchyma; some of which have simple starch grains. In the midrib region upper epidermis is followed by 2-4 layers of collenchyma. The vascular tissue is present in the centre. It is shaped like horse shoe and is surrounded by phloem cells; below which are present 3-4 layers of collenchyma cells followed by lower epidermis [16, 17, 18, 19]

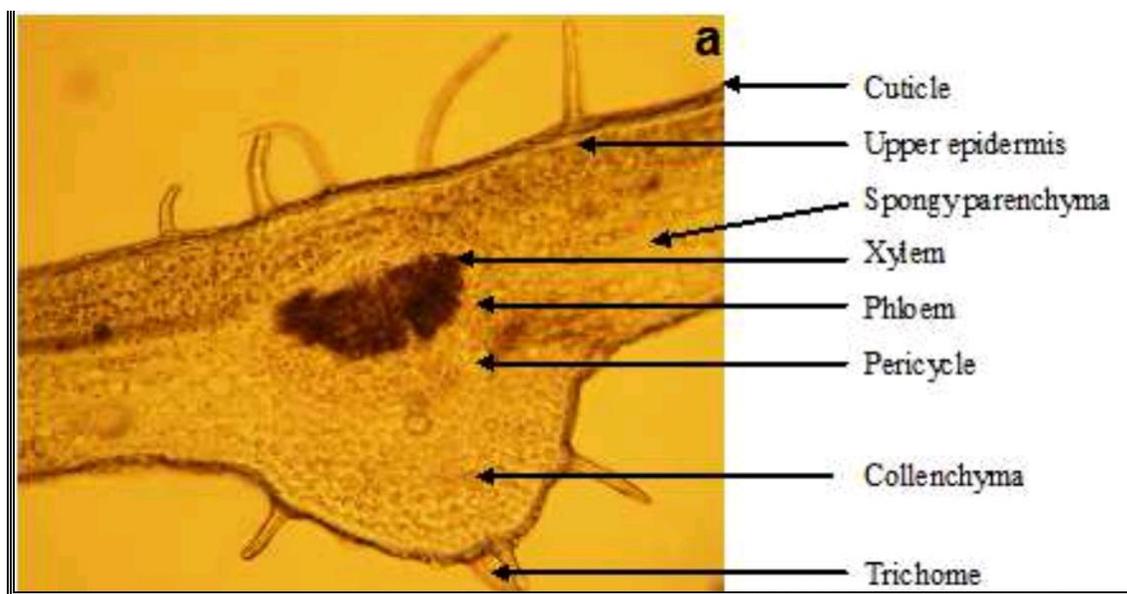


Figure3.2: Transverse section of *Jasminum auriculatum*

Powder microscopy

The powder microscopy of the leaf shows following structures as shown in Figure 3(a, b, c, d). Powder of leaf shows numerous simple thick walled warty, uniseriate, multicellular covering trichomes. Many of them were attached to the

epidermal cells. The upper and lower epidermis was seen in their surface view. The lower epidermis shows the presence of paracytic stomata. The leaf fragments showing palisade cells in surface view were also visible. Fragments of vascular tissue were also present.

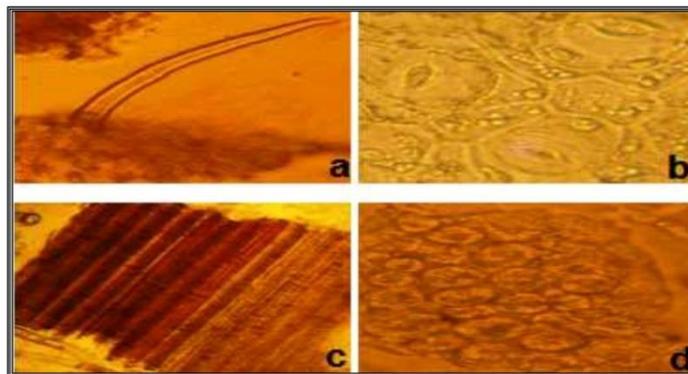


Figure3.3: a) Covering trichomes, b) Paracytic stomata c) Vascular bundle d) Palisade cells.

MATERIALS AND METHODS

Plant collection

The plant *Jasminum auriculatum* is mainly distributed all over India especially South India, the plant was collected in the local area of Kadapa district. The collected species were authenticated by a renowned Botanist Dr. K. Madhava Chetty, Asst. professor, Department of Botany, S.V. University, Tirupati.

EXTRACTION

Preparation of extracts

The shade dried aerial parts of plant materials were reduced to moderately coarse powder and extracted successively with solvents ethanol, methanol, acetone, and water and extracted by simple maceration technique.

Phytochemical investigation

Phytochemical analysis of extract was carried out to find out the presence or absence of phytoconstituents viz tannins, glycosides, carbohydrates, flavonoids etc.

Antibacterial studies

The term bacterial assay designates a type of biological as a performed with bacteria. The bacterial biological assay is based upon a comparison

of the inhibition of growth of bacteria measured by concentration of the compound/test extract to be examined with that produced by non concentration of a standard preparation of the antibiotic having a non activity. The bacterial assay may be carried out by disc plate method.

Disc plate method

This method tests the effectiveness of antibiotics on a specific microorganism. Disc containing antibiotics are placed on an agar plate where bacteria have been placed. This method depends upon the diffusion of antibiotics from antibiotic disc to an extent such that growth of added bacteria is prevented entirely in a circular area of "Zone" around the disc containing a solution of the antibiotic or test substance.

Antibacterial studies

The following strains of bacteria have been used for the study.

1. Streptomyces aureus
2. Escherichia coli

Preparation of Culture Media

The media used for the growth of bacteria was

1. Nutrient broth
2. Nutrient agar medium

Nutrient broth: The nutrient broth was prepared as per the following formula.

Peptone – 1%
Sodium chloride - 0.5%
Beef extract - 1%
pH – 7.4

Method of preparation

For the preparation of nutrient broth, 4g beef extract, 2g of sodium chloride and 4g of peptone were accurately weighed and transferred to a beaker. To it 400 ml of distilled water is added, stirred well to dissolve the contents and the pH adjusted to 7.4 by either using Sodium hydroxide (1N) or Hydrochloric acid.

Then the nutrient growth was sterilized by autoclave at 15 lb/sq inch at 121°C for 15 minutes.

Nutrient agar medium

The nutrient agar medium was prepared as per the following formula.

Peptone – 1%
Sodium chloride – 0.5%
Beef extract – 1%
Agar – 2%
pH – 7.4

Preparation of Test Inoculums

Sub culture

The strains of bacteria were procured from NCIM, Pune. A loop full of the test strain was inoculated into conical flask containing 25ml of sterile nutrient broth. These conical flask were incubated at 37°C for 24hr. This is referred as Seeded broth.

RESULTS

Pharmacognostical analysis

The present study on pharmacognostical characteristic of *Jasminum auriculatum* provide useful information for its correct identity and help to differentiate from the closely related other species.

Ash values

Different ash values such as total ash, acid insoluble ash, water soluble ash and extractive values like water soluble and alcohol soluble extractive of *Jasminum Auriculatum* were determined. The values are shown in table 5.1.1

Table 5.1.1 Ash values of *Jasminum auriculatum*

Plant parts	Total ash	Acid insoluble ash	Water soluble ash
Aerial parts	19%	115%	18%

Extractive values

The percentage yield of *Jasminum auriculatum* were determined by simple maceration technique

by using different solvent and the values are shown in the table 5.1.2

Table 5.1.2: Extractive values of *Jasminum auriculatum*

Type of solvent	Extractive value
Water	9.2%
Ethanol	6.7%
Methanol	4.3%
Acetone	2.7%

Moisture content

The moisture content of the powdered aerial parts of *Jasminum auriculatum* was determined and shown in table 5.1.3

Table 5.1.3: Moisture content in *Jasminum auriculatum*

Wt. of Powdered drug	Moisture content
2gm	14%

Detection of phytochemical constituents

Table 5.2.1 shows the results of preliminary phytochemical screening of ethanolic extracts of *Jasminum auriculatum*. The results of the study

showed the presence of alkaloids, carbohydrates, amino acids, volatile oils, flavanoids, and fats and oils.

Table 5.2.1.: Results of phytochemical screening on *Jasminum auriculatum*

Sl. no	Phytochemical Constituents	AEECA
1.	Carbohydrates	+
2.	Proteins	-
3.	Amino acids	+
4.	Fats and oils	+
5.	Steroids	-
6.	Volatile oils	+
7.	Glycosides	-
8.	Flavonoids	-
9.	Alkaloids	+
10.	Tannins	-
11.	Saponins	-

+ = Present and - = Absent

Anti bacterial activity

- The ethanolic extracts were used to find antibacterial activity. These were given positive result for the study.
- The antibacterial studies were investigated by disc-plate method.
- The plant extracts were tested for antibacterial activity at a concentration of 10, 20, 30, 40, 50µg/ml Streptomycin was used as standard for the antibacterial activity.
- Results were tabulated in Table-5.3.1

Table 5.3.1: Antibacterial activity (zone of inhibition) of ethanolic extract of *Jasminum auriculatum*

S.No	TEST PATHOGEN	ZONE OF INHIBITION					
		VOLUME OF EXTRACTS					STREPTOMYCIN
		10µg/ml	20µg/ml	30µg/ml	40µg/ml	50µg/ml	30µg/ml
1	Escherichia coli	0.9	0.9	1	1.1	1.1	1.5
2	Streptomyces aureus	0.9	1	1.2	1.2	1.3	1.6

Antibacterial activity

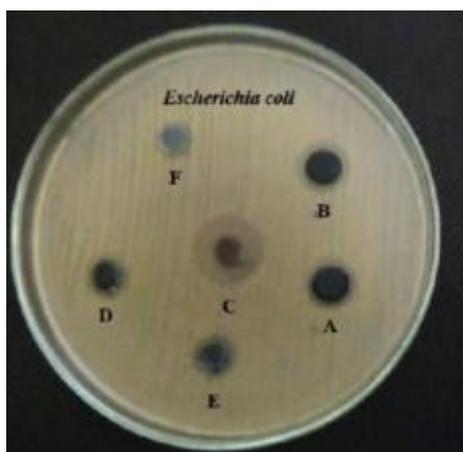
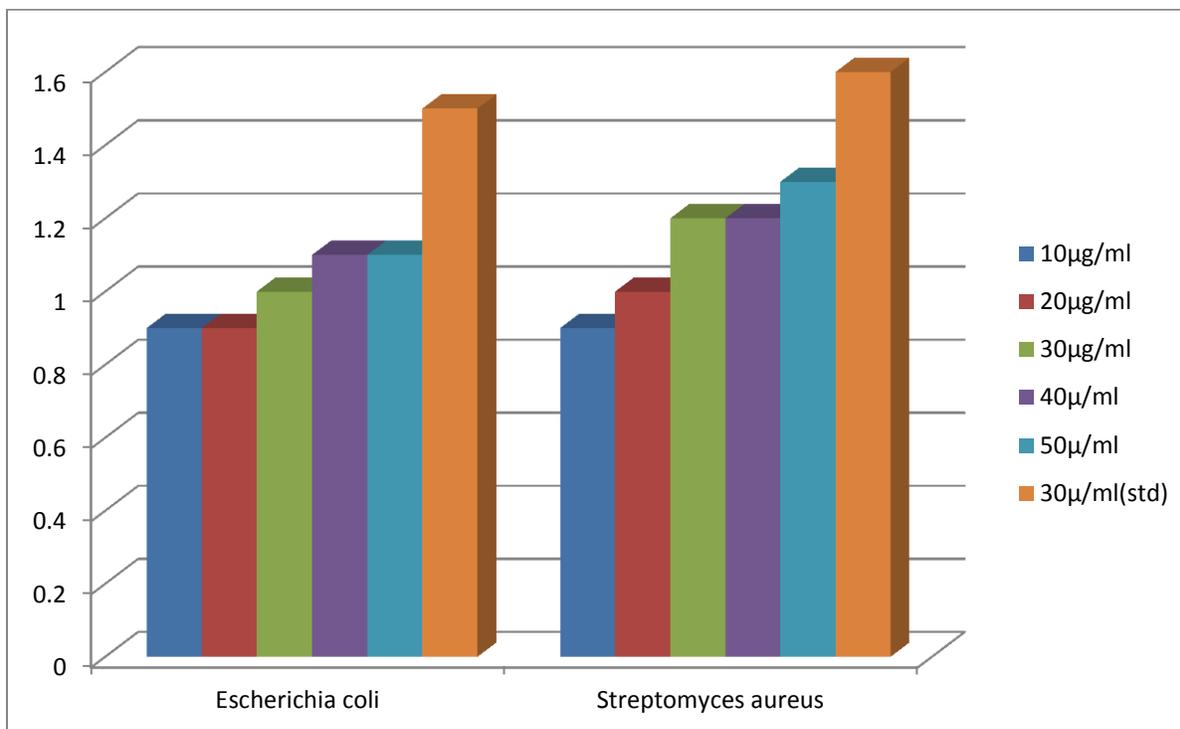


Fig: 5.1 Antibacterial activity of *Escherichia coli*

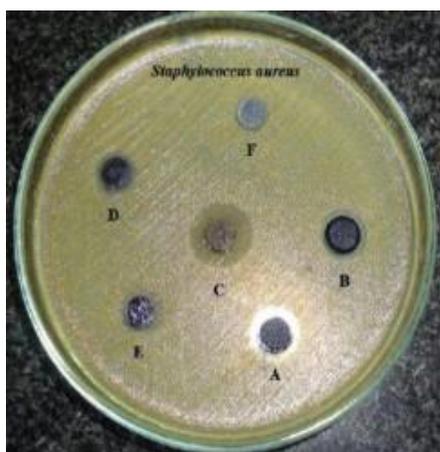


Fig: 5.2 Antibacterial activity of *Streptomyces aureus*

Table: Antibacterial activity of ethanolic extract of *Jasminum auriculatum*

S.No	TEST PATHOGEN	ZONE OF INHIBITION					
		VOLUME OF EXTRACTS					STREPTOMYCIN
		10µg/ml	20µg/ml	30µg/ml	40µg/ml	50µg/ml	30µg/ml
1	<i>Escherichia coli</i>	0.9	0.9	1	1.1	1.1	1.5
2	<i>Streptomyces aureus</i>	0.9	1	1.2	1.2	1.3	1.6

CONCLUSION

The pharmacognostical studies on *Jasminum auriculatum* provide useful data for the correct identification of the plant. The plant was extracted with various solvents of increasing polarity. The obtained extracts are screened for different phytoconstituents. The ethanolic extracts are showing very good reaction for carbohydrates, alkaloids, volatile oils, flavanoids, tannins, saponins fats and oils and amino acids. This may be the reason for the very good antibacterial activity. Among the various extracts ethanolic extract is having more number of active constituents. So this extract is taken to investigate the antibacterial

activity of the plant. The plant is claimed to be used as antilithiatic, treatment of wound healing and skin disease in traditional medicine. The plant screened for its antibacterial activity. The experimental results suggest that *Jasminum auriculatum* has potential antibacterial property.

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