



# REVIEW ON CHARACTERISTICS OF *Justicia tranquebariensis*

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## Abstract

Medicinal plants are the local heritage with universal importance. World is gifted with a rich wealth of medicinal plants. Herbs have always been the principal source of medicine in India and presently they are becoming popular throughout the world. Plants have played a significant role in maintaining the quality of human life for thousands of years and served humans as with cosmetics dyes and medicines. Traditional medicine is the oldest method of curing diseases and infection and various plants have been used in different parts of the world to treat human diseases and infection. Medicinal plants are known to owe their curative potentials through certain biologically active substances which exist in different parts of the plants. The major lacuna is the lack of proper identification and information about the medicinal plants. *Justicia tranquebariensis* belongs to the family Acanthaceae. Mostly the leaves are used for the medical purpose. It is one of the most important herbs being used in Ayurvedic system of medicine. Predominantly, the leaves are used for several medicinal purposes. A wide variety of biologically active constituents such as Phytosterol, Flavonoids, Glycosides, Steroids and Phytosteroids, Coumarins, Cardiac Glycosides, Glycosides, Terpenoids, Carbohydrate, Amino Acids, Gums and Mudilage, Saponins, oil and fats are present in this plant. It exhibits antioxidant, hepatoprotective, antihelmethic, cardioprotective, antiulcerogenic, bronchial asthma, anti-arthritic and antimicrobial activities. This review will focus on the phytochemical constituents isolated from the plants and phytopharmacological properties of different parts of *Justicia tranquebariensis*.

**KEY WORDS :** *Justicia tranquebariensis*, Acanthaceae, Ayurvedic, Phytochemical, antioxidant, antibacterial activity.

## I. Introduction

Plants have played a critical role in maintaining human health and civilizing the quality of human life for thousands of years. Nowadays, humans are showing immense interest to understand the composition of plants due to rich bioactive compounds. Medicinal plants are considered as chemical factory because it produces several compounds for uses of mankind (Palaniswamy *et al.*, 2011). The use of plants as medicine is as old as human civilization itself (Dhankhar *et al.*, 2011). Some of the plants are used as food while others show beneficial effect against various human ailments. The drugs are isolated either from the whole plant or from different parts of the plants like leaves, stem, bark, root, flower or seed. Some drugs are prepared from excretory plant products such as gums, resins and latex. Natural products derived from plants have historically played an essential role in the discovery of novel new pharmaceuticals. The plant kingdom still holds various species of medicinal plants containing materials of medicinal value which are yet to be discovered (Kavitha *et al.*, 2014).

1.1 *Justicia tranquebariensis* (*J. tranquebariensis*) is a small shrub widely distributed in the tropical regions of the world (Krishnamoorthi, *et al.* 2015). It comprises approximately 300 species all around the globe and among them almost 50 species have been recorded in India. Some of the species which belong to the genus *Justicia* are *J. betonia* L., *J. glabra*, J. Koenig ex Roxb, *J. glauca* Rottler, *J. micrantha* Wallich ex., *J. prostrate* Gamble, *J. simplex* D. Don, *J. tranquebariensis*, *J. beddomei* (Clarke) Bennett, *J. spicigera*, *J. procumbens* L., *J. betonia* L. *J. diffusa* Willd and *J. betonica* (Kavitha *et al.*, 2014). *Justicia* has been used in traditional medication for the remedy of fever, pain, infection, diabetes, diarrhea and liver sicknesses (Ratha Bai *et al.*, 2015). A paste product of the leaves is used externally at the site of swelling to lessen the pain (Saritha *et al.*, 2013). They also possess antitumor, antiviral, analgesic and anti-inflammatory activities (Pavithra *et al.*, 2017)

## 1.2 The taxonomic classification of this plant is as follows

### Taxonomic classification

Kingdom : plantae  
 Division : magnoliophyta  
 Class : magnoliopsida  
 Order : scrophulariales  
 Family : acanthaceae  
 Subfamily : acanthoideae  
 Genus : *Justicia*  
 Species : *tranquebariensis*



Figure 1: *Justicia tranquebariensis*

### 1.3 Local Names of the Plant:

This plant is known as sivanarvembu, tavashoomoorunghie, punnakupudi, tavacumurunkai, tavicimurunkai, kakanacam, niyakkiyamaram, pilavumurunkai, pinnakkucceci, punakuppuntu, punnakkuppuntu, putanayakicceci, taciver., tavacimurunkaicceci, tavamurunkai, tavattumurunkai, mutaliyar, narimurunkai, Vankanattam in Tamil. In Sanskrit and oriya it is pindi. In Telugu it is pindikonda, chikerachettu, kondapindi, redamandalam. In Kannada it is known as shiva naaru balli, kaddiyarakina, kaddiyarakinagida

### 1.4 Description

*J. Transquebariensis* is looked upon as a subshrub with a dwarf appearance having a heavy or woody base at the bottom (Figure 1) (Pavithra *et al.*, 2017). The size of the leaves range from 2.5 to 3 cm × 2cm. The shape of the leaves vary from obovate –orbicular. The apex is obtuse, base cuneate, membraneous, pubescent with a petiole of 1.5cm. The spikes are found in the terminal and axillary regions with approximately 10 cm bracts 1 × 0.7 cm, broadly ovate. The calyx teeth are small and show a length of 5mm and the shape is termed as lanceolate. Predominantly it has 3 nerves and is commonly called as 3-nerved. The corolla is bilabiate, meaning two-lipped shape with a tube length of 5 mm, villous inside, upper lobe 7×5 mm, lower narrow, white with pink blotches. The filaments are found to be dilated to approximately 2 mm. The ovary size is 1.5 mm, ciliate along the margins, style ciliate. Capsule 8 mm, widened above the middle, puberlulus (Saritha *et al.*, 2013)

## II. Traditional Uses

In Ayurveda, *J. transquebariensis* has been used to treat poisonous bites. Leaf juices act as a cooling agent and aperients and also given to children during small box. Crushed leaves are applied to contusions. Leaf paste is applied externally on the swelling to reduce the pain. Root paste is applied for tooth ache. About 20 ml of leaf juice is administrated orally or keeping the leaf paste externally on the sight of snake bite works as an antidote for cobra bites. The plant extract is used in the management of inflammation and arthritis confirming the use of medicinal plants. The leaves are traditionally used to treat chest disease, rheumatism, fever, asthma, pneumonia, tuberculosis, expectorant, diuretic, antispasmodia, antiseptic and to reduce swelling. It is used in the treatment of leprosy, cancer, edema, abscess and skin disorder (Saritha *et al.*, 2013).

## III. Phytochemical Constituents

3.1 The bioactivity in the natural products is due to phytochemicals, often elaborated for the plant defense against herbivory, pathogen attack, inter - plant competition and against abiotic stresses (Briskin *et al.*, 2000). Some phytochemicals are known to have the therapeutic and prophylactic properties, providing nutrition for normal cell health and repairs, inhibit carcinogens and acts as antioxidants. Phytochemicals exert their medicinal effects by acting synergistically or additively and this eliminates the problem of a single xenobiotic compound. It gives the herbal drug a broad spectrum of activity as well as decreases the changes of the pathogen developing resistance or adaptive responses (Olila *et al.*, 2001).

3.2 *Phytochemicals can have complementary and/or overlapping mechanism of action on the body including antioxidant effects, modulation of hormone metabolism, antibacterial and antiviral effect interference with DNA replication and physical action whereby some may bind physically to cell walls thereby preventing the adhesion of pathogens to human cell walls (Sospeter et al., 2013).*

3.3 In plant bioactive compounds are present naturally which play important role for treatment naturally without any side effects ( Palaniswamy et al.,2018). Phytochemical research of leaves of *J. tranquebariensis* showed the presence of phytosterols, flavonoids, glycosides and lack of triterpenoids, alkaloids, saponins and tannins (Akilandeswari et al., 2000). From aerial parts of *J. tranquebariensis* lignans which include aryltertralin were isolated and characterized as (+)-beta-cubebin, (+)-lariciresinol, (+)-isolariciresinol, (+)-lyoniresinol and (+)-medioresinol. Lariciresinol and isolariciresinol along with cubebin (lignan) are validated to be anti-inflammatory, antinociceptive, antiulcerogenic, antimicrobial, cytotoxic and antioxidant activities (Fig 2 ). Lyoniresinol is another vital lignin which is rich in antioxidative and antimutagenetic properties (Pavithra et al., 2017). The alcoholic extract of the aerial parts of *J. tranquebarensis* yielded phytosterol, brassica sterol, campesterol, 7, 22-ergostadienol, stigmasterol, sitosterol, spinasterol, 28-isofucosterol and betasitosterol-3-oglucoside (Leema et al., 2013).

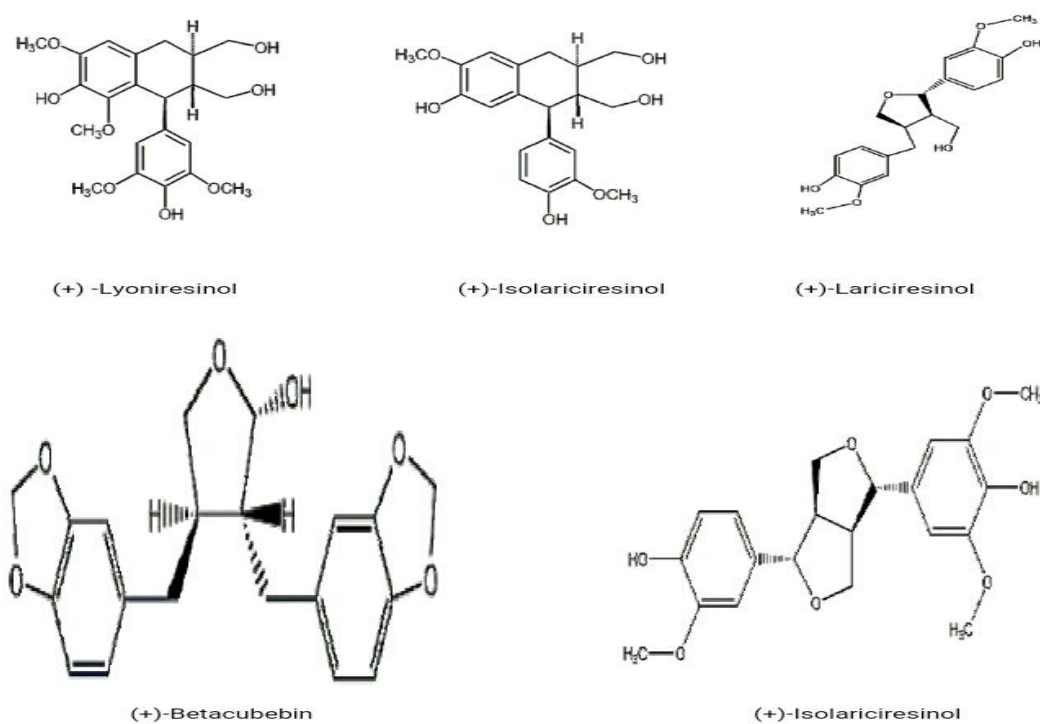


Figure 2: Liganins from *J. tranquebariensis*

#### IV. Antioxidant Activity

4.1 Plants are a rich source of antioxidants which protect us from free radicals that cause tissue damage, neurodegenerative diseases and cancer. It is generated in the biological system in the form of reactive oxygen species which are harmful and these are removed by the antioxidant system in the body. There are several enzymic and non-enzymic antioxidants. When the level of free radicals exceed the ability of the antioxidant system, lipid peroxidation, DNA damage and protein damage occurs which results in aging and various diseases, including inflammation, cancer, cardiovascular disease and lupus ( Palaniswamy et al.,2018).

4.2 Krishnamoorthi et al., (2015) investigated the antioxidant activity of *J. tranquebarensis* leaves by DPPH, free radical scavenging activity, reduction of ferric ion in presence and absence of EDTA and hydrogen peroxide scavenging activity. Different solvent extracts like hexane, ethyl acetate and ethanol were studied for the antioxidant activities using *in vitro* models. The ethyl acetate and ethanolic extract showed significant antioxidant activity at the concentration of 75µg/ml than other fractions. All these results clearly indicate that difference in solvents used for preparing the extract affect the antioxidant activity.

4.3 Kumeshini et al., (2018) examined the protective effect of *J. tranquebariensis* on thioacetamide (TAA)-induced oxidative stress and hepatic fibrosis. Male Wister albino rats were used for the study. Blood and livers were collected and assayed for various antioxidant enzymes (SOD, CAT, GPx, GST, GSH, and GR). Treatment with *J. tranquebariensis* significantly reduced liver TBARS (Thiobarbituric acid reactive substances) and enhanced the activities of antioxidant enzymes in TAA -induced fibrosis in rats. Based on these findings, *J. tranquebariensis* has potent antioxidant potential.

## V. Antibacterial Activity

5.1 Shabana *et al.* (2008) evaluated the antibacterial activity of leaves of *J. tranquebariensis* towards 10 pathogenic microorganism lines; 25mg/ml confirmed more stage of interest than 5mg/ml against all the examined microorganisms in a dose structured manner. Both chloroform and ethanol extract were discovered to own antibacterial activity. But chloroform extract confirmed better interest than ethanolic extract against a number of bacteria, as revealed via *in vitro* agar well diffusion technique. The inhibitory effect of the extract turned into as compared with preferred antibiotic amoxicillin.

5.2 The antibacterial activity of roots and rhizomes of *J. tranquebariensis* linn., was evaluated against different organisms namely *B. subtilis*, *S. aureus*, *E. coli* and *K. pneumoniae* using both petroleum ether and hydroalcohol. In both the extracts, it showed high bacterial activity in Gram positive and negative strains, as revealed by *in vitro* agar well diffusion method (Raja *et al.*, 2008).

## VI. Anti Arthritic Activity

6.1 It was reported that the anti-arthritic activity (*in vitro*) of *J. tranquebariensis* in the treatment of rheumatism has been positive. It was done by protein denaturation method and its effect was compared with the standard drug Diclofenac sodium. The production of auto-antigen in certain arthritic disease may be due to denaturation of protein (Mary *et al.*, 2018).

6.2 Senthamari *et al.* (2013) reported the anti-arthritic activity of the ethanolic extract of *J. tranquebariensis* leaves and *Cissus quadrangularis*. Freund's complete adjuvant induced arthritis in rats using indomethacin as standard drug which was performed to treat rheumatism. In this antiarthritic activity in Freund's adjuvant brought on arthritis, the plant extracts drastically reduced the arthritis of affected joint when as compared with the controlled rats. This study revealed the potential of plant extract in the management of arthritis.

## VII. Anti Inflammatory Activity

7.1 Mary *et al.* (2018) studied the *in vitro* anti-inflammatory activity of leaf extract (methanol, ethanol and water) of *J. tranquebariensis* using HRBC (Human Red Blood Cell) Membrane stabilization method. The HRBC Membrane stabilization activity of the above confirmed stabilization and hemolysis in hypotonic solution while as compared with standard Diclofenac. The HRBC Membrane stabilization activity/safety expanded at the same time as the membrane hemolysis became reduced indicating that the leaves had potential anti-inflammatory activity.

7.2 In another study, Akilandeswari *et al.* (2001) studied anti-inflammatory activity of leaf extracts of *J. tranquebariensis* leaves using the ethanolic extract which showed significant anti-inflammatory activity while in comparison to the standard drug sample.

## VIII. Anticancer Activity

8.1 An *in vitro* anticancer activity of *J. tranquebariensis* roots were done using MTT 3-(4,5 dimethylthiazol-2-yl)-2,5-diphenyl tetrazolium bromide Assay. Hydro-alcoholic root extract of *J. tranquebariensis* showed moderate cytotoxicity. The test substances in different concentration (25-200 µg/ml) were examined in the MTT bioassay. The hydro-alcoholic extract showed less effective cytotoxicity in human cancer cell lines (HeLa cells). Hence the level of cytotoxicity of the hydro-alcoholic extract of *J. tranquebariensis* roots can be concluded to be less effective (Saravanan *et al.*, 2015).

## IX. Bronchial Asthma

9.1 Velpandian *et al.*, (2014) reported the management of bronchial asthma using *J. tranquebariensis* leaf where 40 asthmatics were enrolled for the clinical trail. All the patient were administrated 30 ml leaf juice of *J. tranquebariensis* for the period of 3 months. The study exhibited improvement on subjective and objective parameters of bronchial asthma. The result showed that during the trial period, no side effects were observed. The herbal juice had proved to lower symptom scores and improve the lung function.

## X. Antihelmintic Activity

10.1 The ethanolic extract of the root was investigated for anthelmintic activity in adult worms *in vitro* using Indian earthworm (*Pheretima posthuma*), roundworm (*Ascaridia galli*) and tapeworms (*Raillietina spiralis*). Various concentrations of stem extracts (20, 40, 80 and 100 mg/ml) were applied to different petridishes containing earthworms. The paralysis time and death time were observed and compared with the standard drug piperazine and distilled water as the control sample. Ethanolic extract showed anthelmintic activity in dose-dependent manner giving shortest time of paralysis (P) and death (D) with respect to all three types of worms. Extract exhibited more potent activity at lower concentration against earthworms was shown by the activity of *J. tranquebariensis* root extract (Jiju *et al.*, 2015)

## XI. Hepatoprotective Activity

11.1 The leaf extract of *J. tranquebariensis* showed significant curative effects against acetaminophen induced hepatotoxicity *in vivo* models with a dosage of 500 and 1000 mg/kg that exhibited significant protective effect against acetaminophen induced hepatotoxicity. Leaf extract significantly suppressed mainly the increase in plasma activities of (ALT), alkaline phosphatase (ALP), and total bilirubin (TB) concentration, which are considered as markers of liver functional state (Shabana *et al.*, 2011). All the above information confirmed the protective and curative effects of the aqueous leaf extract of *J. tranquebariensis*.

## XII. Cardioprotective Activity

12.1 The cardioprotective role of *J. tranquebarensis* leaf extract on isoproterenol induced myocardial infarction in Wistar albino rats was studied. The groups were pretreated with the leaf extract for a period of 28 days and received a subcutaneous injection of isoproterenol. After the experimental period, serum was estimated for content of proteins, cholesterol, triglycerides, phospholipids and lipoproteins and the assay of marker enzymes. Increased levels of LDL, VLDL with significant decrease in the level of HDL and rise in the level of myocardial marker enzymes (CK, LDH, ALT and AST) in serum was noted. Oral administration of aqueous leaf extract and isoproterenol-induced rats proved the protective role of the plant (Radhika *et al.*, 2013).

## XIII. Leprosy

13.1 Leprosy is an infectious disease that caused by bacillus bacteria, *Mycobacterium leprae* and has been known since biblical times. It is characterized by disfiguring skin sores, nerve damage, and progressive debilitation. Leprosy is curable with treatment known as multidrug therapy (MDT). Several drugs are used in combination in multidrug therapy. These drugs must never be used alone as monotherapy for leprosy. The World Health Organization system distinguishes "paucibacillary" and "multibacillary" based upon the proliferation of bacteria. MDT consists of 2 or 3 drugs: dapsone and rifampicin for all patients, with clofazimine added for multibacillary disease. This drug combination kills the pathogen and cures the patient. The Bacillus Calmette–Guerin (BCG) vaccine offers a variable amount of protection against leprosy in addition to tuberculosis. (Gosh *et al.*, 2017). These few allopathic drugs are not enough to fight worldwide with this massive number of leprosy patients in poor countries like India. So alternative way should be search and plant medicine will be one of the best options for the treatments of leprosy in poor countries where easily available diverse medicinal plants that are cost effective and biologically safe. Therefore, herbal medicine has played the most important role in the treatment of leprosy. In this *J. tranquebarensis* leaf is used for the treatment of Hansen's disease (Saritha & Brindha *et al.*, 2013)

## XIV. CONCLUSION

Herbal medicine performs a first-rate position in the improvement of present day civilization. *J. tranquebarensis* is traditionally valuable plant which explains that it is a potential candidate rich in phytochemicals and antioxidants. The plant was found to have a broad spectrum of activities due to the presence of active constituents like phytosterols, flavonoids, glycosides and phytosteroids, coumarins, cardiac glycosides, glycosides, terpenoids, carbohydrate, amino acid, gums and mudilage, saponin and oil and fats. It is proved to treat an array of disorders like antibacterial activity, antihelminthic, rheumatism, asthma and many more. The plant has been used for cure against poisonous bites also. *J. tranquebarensis* is the other sources of SIVANARVEMBU a drug of doubtful origin and justifies its usage in Siddha system as a febrifuge, antiinflammatory and anticancer agent as drug molecules possessing these properties are present in this plant drug. Tribal reports support its use in skin diseases as claimed in Siddha system. From the review, it can be concluded that the leaves of *J. tranquebarensis* could be useful for the development of commercial drugs in the future.

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