

Review Article

Phytochemistry and pharmacology of *Pyrostegia venusta* : a plant of Family Bignoniaceae

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Abstract

Worldwide over 80% population have dependence on natural resources (esp. plants) for treatment of disease, either due to drug resistance diseases or side effects of synthetic drugs. Hence, in recent years, ethano-medicinal studies have been acknowledged to evaluate plants products in modern scientific lines of phytochemical analysis, pharmacological screening and clinical trials. This review provides information on the botanical description, traditional uses, phytochemistry and pharmacology of one such important plant, *Pyrostegia venusta*. That has folkore tradition of medicinal use.

Keywords: *Pyrostegia venusta*, phytomedicine, phytoconstituent, phytotherapy,

Introduction

Pyrostegia venusta (Ker-Gawl) Miers (family, Bignoniaceae) is a neotropic evergreen vine that makes a beautiful ornamental plant with cascades of orange flowers. It is commonly grown in tropical and subtropical areas, as well as in mild Mediterranean climates. The plants form dense masses, growing up trees, on walls or over rocks, and are covered with flowers in the cool, dry season. Native Brazilians use decoction of aerial parts of *P. venusta* for the treatment of cough and flu. The general tonic control diarrhoea, vitiligo, and jaundice [1, 2, 3]. Tonics made from the stems of this plant are useful for the treatment of diarrhoea, whereas flower preparations have been showed to attenuate vomiting [3]. After careful review of the literature, the methanol extracts of the flowers and roots of this plant were screened for phytochemical and pharmacological properties. A considerable body of research in this area is poised to provide the pharmacological basis for the development of novel treatments based upon the unique ability to selectively eliminate free radicals. If such medicinal potential was gauged correctly, then use of this plant could justify and provide a novel pathway for the treatment of diseases such as arthritis.

Taxonomy

Class: Equisetopsida
Subclass: Magnoliidae
Superorder: Asteranae
Order: Lamiales
Family: Bignoniaceae
Genus: *Pyrostegia*

Common names

English common name are flame creeper, flame flower, flame flower vine, flame vine, flamevine, flaming trumpet, flaming trumpet vine, golden shower, golden shower vine, golden showers, orange creeper, orange creeper vine, orange trumpet creeper, orange trumpet vine

Brazilian Native names: Cipó-de-são-joão, flor-de-são-joão, cipó-de-cesto, cipó-de-fogo, cipó-delagartixa, cipó-pé-de-lagartixa, cipó-delagarto, cipó-catitu,

*Tamil Name :*Thanga poo

Latin name: *Pyrostegia venusta* (Ker Gawl.) Miers.

Distribution: *Pyrostegia venusta* is native to Brazil, Bolivia, Argentina and Paraguay in South America. It is widely used as ornamental beauty. This is excellent for landscaping and to cover and decorate garden fences. This species is invasive in some regions (e.g. Peru and Australia). *Pyrostegia venusta* flowers for about 14-16 weeks between December to March with optimum flowering between January to February in Agra, India. Despite normal flowering it remains fruitless at Agra [4].

Macroscopic description

Pyrostegia venusta is a fast-growing, evergreen woody vine that flourishes magnificent reddish-orange flowers. The compound leaves have 5.1-7.6 cm and are arranged in pairs opposite each other on the stem. Often, the center leaflet is modified into a coiled, three-parted tendril. Flame vine branches profusely and climbs by clinging with its tendrils. The tubular flowers are about 7.6 cm with the corolla in five lobes. Fruits are slender dry capsules [5].

P venusta Foliage



Palmately compound leaves of *P venusta* found on stem are opposite/subopposite. Leaves margins are entire, ovate, with pinnate venation, evergreen. Length of leaf blade extends 2 to 4 inches.

P venusta Flower

The orange color, tubular flowers of *P venusta* showed dichasial cymes Inflorescence, winter flowering and fall flowering. The long orange stamens and style extends beyond the tube.

P venusta Fruit

Found in elongated shape of length 6 to 12 inches with dry or hard cover, inconspicuous and not showy.

Phytochemistry and Phytoconstituent of *Pyrostegia venusta*

Pyrostegia venusta is a natural source of phytochemicals. Flowers and roots extracts have showed terpenoids, alkaloids, tannins, steroids, and saponins.

The literature records the phytochemical study of the flowers of *P. venusta*, from which the compounds β -sitosterol, n-hentriacontane, acacetin-7-O- β -glucopyranoside and meso-inositol have been isolated [3, 6]. Other studies have indicated the presence of carotenoids in the flowers [7] and rutin in the leaves [8].

GCMS analysis of flower extract has showed the presence of Acetophenone; α -L-Mannopyranoside, methyl 6-deoxy-2,3,4-tris-O-(trimethylsilyl)-;3H-3a,7-Methanoazulene, 2,4,5,6,7,8-hexahydro-1,4,9,9-tetramethyl-, (3aR (3a.alpha.,4.beta.,7.alpha.))- (Synonym Cyperene); trans-3-Hexenedioic acid, bis(trimethylsilyl) ester; β -DL-Arabinopyranose, 1,2,3,4-tetrakis-O-(trimethylsilyl)- (Synonym- B Arabipyranos); Ethylmalonate, ethyltrimethylsilyl ester; Propionic acid, pentamethylidilanyl ester; Glycoside, α -methyl-trtrakis-O-(trimethylsilyl)-;Hexadecanoic acid, methyl ester (Synonym-Palmitic Acid; D-Xylose, tetrakis(trimethylsilyl)-;Glycoside, α -methyl-trtrakis-O-(trimethylsilyl)-;Gluconic acid, 2-methoxime, tetra(trimethylsilyl)-, trimethylsilyl ester; 12-Octadecadienoic acid, methyl ester (Synonym Linoleic acid); 9-Octadecenoic acid (Z)-, methyl ester (Synonym Oleic Acid) ;Myo-Inositol, 1, 2, 3, 4, 5, 6-hexakis-O-(trimethylsilyl)-; Docosanoic acid, methyl ester (Synonym Hysterene); 1,2-Benzenedicarboxylic acid, mono(2-ethylhexyl) ester (Synonym Pthalic Acid); Methyl 10-methyl-undecanoate; (1,2,4)Triazolo(1,5-a)pyrimidine-6-carboxylic acid, 4, 7-dihydro-7-imino-, ethyl ester; Dotriacontane; Silicic acid, diethyl bis(trimethylsilyl) ester; Tetracosanoic acid, methyl ester; Di-n-decylsulfone; Dodecahydropyrido(1,2-b)isoquinolin-6-one; Heptacosane; Tetrasiloxane, decamethyl-; Tetradecanoic acid, 12-methyl-, methyl ester; Stigmasterylitosylate; 2-p-Nitrophenyl-oxadiazol-1, 3, 4-one-5; 2-Methyl-6-(5-methyl-2-thiazolin-2-

ylamino)pyridine; Diazoprogestrone; 1, 6-Dibromo-2-cyclohexylpentane; Cyclotrisiloxane, hexamethyl-; cis-2-Hexen-1-ol, trimethylsilyl ether[9].

It has been demonstrated that the compounds acacetin-7-O- β -glucopyranoside and β -sitosterol showed anti-inflammatory activity [10, 11]. The Dr. Duke's phytochemical and ethnobotanical database [12] has mentioned some of these compounds to be useful in various medicinal complications. Database has mentioned that Acetophenone are useful Antibacterial, fungicide, pesticide, hypnotic, perfumery, soporific; 3H-3a,7-Methanoazulene, 2, 4, 5, 6, 7, 8-hexahydro-1, 4, 9, 9-tetramethyl-, (3aR-(3a.alpha.,4.beta.,7.alpha.))- (Cyperene) is a Anti-malarial and Anti-plasmodial; Hexadecanoic acid, methyl ester (Synonym-Palmitic Acid) is an Antioxidant, hypo-cholesterolemic-nematicide, pesticide, anti-androgenic flavor, hemolytic, 5- Alpha reductase inhibitor; 9, 12-Octadecadienoic acid, methyl ester (Synonym - Linoleic acid) is an Anti-inflammatory, hypo-cholesterolemic cancer preventive, hepatoprotective, nematocide, insectifuge, anti-histaminic anti-eczemic, anti-acne, 5-Alpha reductase inhibitor, anti-androgenic, anti-arthritic, anti-coronary, insectifuge; 1,2-Benzenedicarboxylic acid, mono (2-ethylhexyl) ester (Synonym - Pthalic acid) is useful in preparation of perfumes and cosmetics, and as plasticized vinyl seaton furniture and in cars, and clothing including jackets, raincoats and boots, as well as in textiles, as dye stuffs, cosmetics and glass making; Myo-Inositol, 1, 2, 3, 4, 5, 6-hexakis-O-(trimethylsilyl)- is useful in anti-depression, liver problems, panic disorders and diabetes; 9-Octadecenoic acid (Z)-, methyl ester is a 5-alpha-reductase-inhibitor, allergenic, alpha-reductase-inhibitor, anemiagenic, anti-alopecic, anti-androgenic, anti-inflammatory, anti-leukotriene-D4 (anti-platelet activating factor), dermatitogenic, insectifuge, perfumery, propepic cancer-preventive, choleric, flavor, hypocholesterolemic, irritant, percutaneostimulant; Stigmasterylitosylate is used as anti-hepatotoxic, anti-inflammatory, anti-ophidic, anti-oxidant, artemecide, extrogenic, sedative.

Beneficial effect on diseases

Pyrostegia venusta (Ker Gawl.) Miers is used in traditional medicine for the treatment of vitiligo, dysentery, immoderate menstrual flow, common diseases of the respiratory system, and for the treatment of genital infections. Native Brazilians administer decoction of aerial parts of *P. venusta* for the treatment of cough and flu and also as an infusion to treat diarrhoea, vitiligo, and jaundice.

Immuno-Modulatory: Study of the methanol extract of flowers and leaves of *P. venusta* showed stimulation of the immune system. It support increase in anti-inflammatory and suppress pro-inflammatory cytokines.

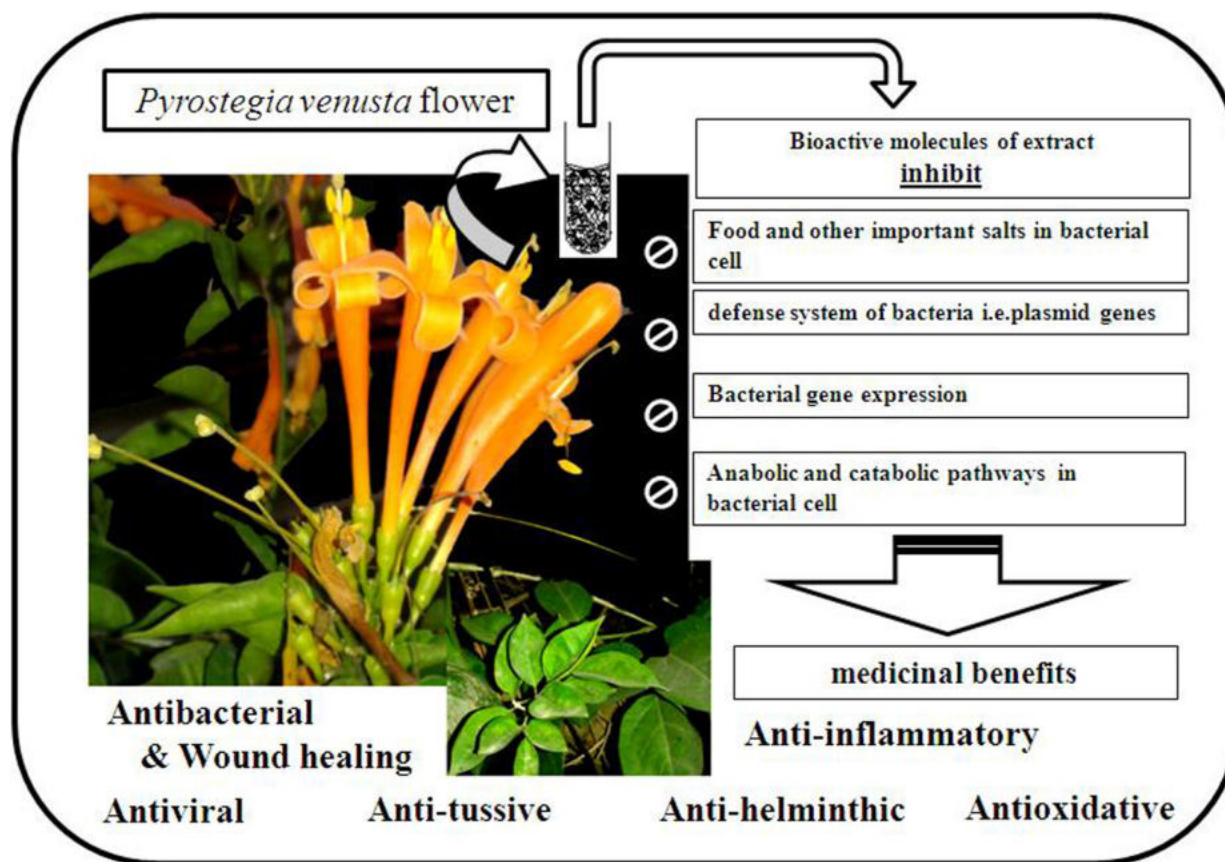


Figure-1: Extract from flower of *Pyrostegia venusta* contains several bioactive components. These components are hypothetically responsible for various medicinal activities. The possible mechanism behind various healing activity of flower extract has been mentioned in this figure.

Anti-inflammatory activity

β -sitosterol, n-hentriacontane, acacetin-7-O- β -glucopyranoside and meso-inositol having anti-inflammatory activities [10, 11]. Others studies have demonstrated that acacetin inhibits the induction of nitric oxide synthase (NOS) and cyclooxygenase-2 (COX-2) in macrophages that are activated with LPS by inhibiting the transcriptional activation [13, 14, 11]. LPS produces pro-inflammatory cytokines which provokes a number of neuropsychological symptoms collectively referred to sickness behavior [15, 16]. The precise mechanisms that are involved in the production of the anti-nociceptive and anti-inflammatory responses of the *Pyrostegia venusta* extract are not completely understood. The presence of flavonoids and phenolic compounds has been correlated with potential degrees of anti-inflammatory and analgesic activity [17].

Antibacterial & Wound healing

Wound infections are difficult to manage in developing countries due to poor hygienic conditions. *Staphylococcus aureus*, *Streptococcus pyogenes*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Streptococcus pneumoniae* and *Klebsiella pneumoniae* are some important organisms of wound infection [18]. Wound Healing Potential of *P. venusta* on infected Wistar Rat Model: flower

extract treated rats showed better wound closure and improved tissue regeneration. Study provides scientific rationale for the traditional use in wound treatments [19]. The anti-bacterial property against these pathogens is suggested but exact mechanism(s) and the active principles remain to be investigated.

- Pharmacognosy:** Qualitative chemical tests of the methanol extract revealed the presence of tannins, flavonoids, steroids, glycosides and carbohydrates.

- Hepatoprotective:** It may possess hepato-protective activity. Study based on presence of potential antioxidant and hepato-protective molecules has indicated and need to be proved on a study on induced hepatitis in rats.

- Antitussive:** Flavonoid, cyanogenic glycoside, tannin & phenol exhibit significant antitussive activity. These phytochemicals are present in *Pyrostegia venusta* but there is a lack of research studies in support.

- Antifungal/antiviral:** Presence of various phytochemicals in plant extracts deserves bio-guided studies for the isolation of antiviral compounds and studies on mechanism of action.

- Anthelmintic:** Helminths are parasitic worms. They are the most common infectious agents of humans in developing countries and produce a global burden of disease that exceeds better-known conditions, including malaria. Methanol and chloroform extract of *Pyrostegia venusta* is a significant source of anti-helminthic activity.

These extract take more time to remove helminthes than piperazinecitrate but that is free from side effect of synthetic drugs [20].

•**Antioxidant:** Study showed the methanol extract of seeds has significant radical scavenging activity [9].

•**Antitumor activity:** Hydroalcoholic extract of *P. venusta* have moderate cytotoxicity and significant antitumor activity [21].

•**Hyperpigmentant activity:** Low concentration of hydroalcoholic extracts of leaves and flower of *P. venusta* indicated anti vitiligo (hyperpigmentant) activity [22].

•**Genotoxicity testing:** *Pyrostegia venusta* (Ker Gawl.) Miers, Bignoneaceae, studied to evaluate the genotoxic effect in mice using the micronucleus and chromosome aberration tests. *P. venusta* didn't show genotoxicity activity [23].

Conclusion

Pyrostegia venusta's products or metabolites need evaluation on modern scientific lines based on various pharmacological activities

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as discussed in present paper. Bioactive molecules need to be explored scientifically and utilization for clinical trials.

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Author's contribution

All the authors have been contributed equally to imagine and design the manuscript and have read the manuscript.

Conflict of interest

Authors do not have conflict of interest to declare.

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