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# PHARMACOGNOSTIC STANDARDIZATION AND PRELIMINARY PHYTOCHEMICAL SCREENING OF PYROSTEGIA VENUSTA MIERS (BIGNONIACEAE) LEAVES

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## ABSTRACT

*Pyrostegia venusta* is one of the most famous and beautiful flowering vines in the world. It was used in Brazil as a traditional medicine throughout history. It is considered a natural source of antioxidants, which contain significant amounts of phytochemicals with antioxidant properties, which could act as inhibitors of free radicals. *Pyrostegia venusta* could be a potential source of herbal pharmaceuticals and could form a strong basis for more research on the possible discovery of new natural bioactive compounds. This study determines various pharmacognostic and phytochemical standards helpful to ensure the purity, safety, and efficacy of medicinal plant *Pyrostegia venusta*. Standardization of plant is an essential measurement for ensuring the quality control of the herbal drugs Preliminary screening of phytochemicals is a valuable step, in the detection of the bioactive principles present in medicinal plants and subsequently may lead to drug discovery and development.

**KEYWORDS:** *Pyrostegia venusta*, Leaves, Pharmacognostic standardization, Phytochemical screening, TLC.

## INTRODUCTION

A medicinal plant is any plant that, in one or more of its organs, contains substances that can be used for therapeutic purposes or that are precursors for the synthesis of useful drugs. This description makes it possible to distinguish between medicinal plants whose therapeutic properties and components have been scientifically established, and plants that are considered medicinal but have not yet been the subject of in-depth scientific study. Medicinal plants have been used in health care since time immemorial.[1] Many plants have been used in traditional medicine for many years. Some appear to work even though there is not enough scientific data (double-blind trials, for example) to confirm their effectiveness. Such plants must qualify as medicinal plants. The term "crude drugs of natural or biological origin" is used by pharmacists and pharmacologists to describe whole plants or parts of plants that have medicinal properties.[2] Before the introduction of chemical medicines, man relied on the healing properties of plants medicinal. Some people like these plants because of the ancient belief that plants are created to provide humans with food, health care, and other purposes. Around 80% of the world's 5.2 billion people are believed to live in less developed countries and the World Health Organization estimates that around 80% of these people rely almost exclusively on traditional medicine for their primary care needs of health. Medicinal plants are the "backbone" of traditional medicine.[3] Medicinal plant testing has a long history, especially when it comes to assessing the quality of a plant. The earliest techniques were organoleptic using the physical senses of taste, smell, and appearance. Then gradually these led to more advanced instrumental techniques.[4]

*Pyrostegia venusta* Miers (Family, *Bignoniaceae)* is an evergreen vine that makes a beautiful ornamental plant with cascades of orange flowers. It is commonly grown in tropical, subtropical, and temperate Mediterranean climates. The plants form dense clusters, grow on trees, walls or rocks and are covered with flowers in the cool and dry season. Brazilian natives use the decoction of aerial parts of P. venusta for the treatment of cough and flu. The general tonic controls diarrhea, vitiligo and jaundice. Tonics made from the stems of this plant are useful for treating diarrhoea, while flower preparations have been shown to relieve vomiting. After a careful review of the literature, the phytochemical and pharmacological properties of methanolic extracts from the flowers and roots of this plant were examined. A significant body of research in this field is able to provide the pharmacological basis for the development of new treatments based on the unique ability to selectively scavenge free radicals. If this medicinal potential were properly evaluated, the use of this plant

could justify the treatment of diseases such as arthritis and open a new path. Pyrostegia venusta is found in tropical and subtropical areas and is native to southern Brazil, northern Argentina, and Paraguay. Flame vine tolerates alkaline soils with an acid effect. This is the famous ornamental vine that covers fences and walls in Bangalore, Karnataka, India. Brazilian indigenous people use the aerial parts of P. venusta to treat coughs and flu. The decoction of this plant was administered orally as a general tonic for the treatment of diarrhoea, vitiligo and jaundice.[5,6,7]

**Figure 1: *Pyrostegia venusta* miers (Family- *Bignoniaceae).***

**Taxonomical classification[7]**
Kingdom: Plantae
Division: Tracheophyta
Class: Equisetopsida
Order: Lamiales
Family: Bignoniaceae
Tribe: Bignonieae
Genus: Pyrostegia
Species: *Pyrostegia venusta*

**Vernacular name:** Flame creeper, Flame tree, Flame tree plant, Flame rose, Flame vine, Burning trumpet, Burning trumpet plant, Golden shower, Golden shower rose, Golden vine, Orange creeper, Orange creeper vine, Orange trumpet creeper, orange trumpet vine, Sankrant vel.

**Etymology:**"Pyrostegia" is Greek derived: pyro meaning 'fire' and stege meaning 'covering.' names: Species name venusta means 'pleasing.'

The study conducted with the objective of evaluation of plants on the basis of various methods including macroscopic, microscopic, physicochemical, and phytochemical methods were applied to determine the diagnostic features for the identification and standardization.

## MATERIAL AND METHODS[13,14]

### Plant material

Fresh leaves of *Pyrostegia venusta* were obtained from the Chinchwad, Pune and authenticated at the Botanical survey of India, Pune, Maharashtra where a specimen (CATPV-1) has been deposited.(Ref no. BSI/WRC/Iden.cert./2022/2312220005212)

**Organoleptic evaluation:** The sensory natures of dry powder of selected plants were observed by keeping a small quantity in a petri dish which is placed on a white background. The organoleptic characters as per pharmacopoeial standards were observed and tabulated.

**Botanical evaluation:** Macroscopic Characters were determined by simple observations. Microscopic characters were determined by observing through microscope. Fluorescence of the drug was observed under day and UV light (254nm) using various solvent extracts as well as treating with acids and alkaline solutions of the drug. The powder was treated with neutral solvents like Hexane, Benzene, Chloroform, Ethyl acetate, Alcohol, Acetone and acids like 1N Hydrochloric acid, 50%Sulphuric acid and alkaline solutions like aqueous and alcoholic 1N NaOH.

### Determination of foreign matter

100 g of the drug sample was weighed and separated out in a thin layer. The foreign matter was detected by inspection with the unaided eye. It was separated, weighed and calculated the percentage of foreign matter present.

### Determination of moisture content (Loss on drying)

Weighed 2g of drug accurately in a tarred evaporating dish. The weighed sample of the drug was placed in the tarred evaporating dish, dried at 105º for 5 hours, and weighed. The drying and weighing were continued at one-hour interval until difference between two successive weighing almost correspond and difference was not more than 0.25 %. When Constant weight is reached, the material was cooled for 30 minutes in desiccators. The percentage of moisture content was calculated.

**Determination of total ash**

Incinerated about 2g of accurately weighed drug in a silica dish at temperature not exceeding 450 ºC until free from carbon and weighed. Calculated the percentage of ash with reference to the air-dried drug.

**Determination of acid insoluble ash**

Boiled the ash obtained from total ash for 5 minutes with 25 ml of dilute hydrochloric acid. Collected the insoluble matter in an ash less filter paper, washed with hot water and ignited to constant weight. Calculated the percentage of ash with reference to the air-dried drug.

**Determination of water soluble ash**

Boiled the ash obtained from total ash for 5 minutes with 25 ml of distilled water. Collected the insoluble matter in an ash less filter paper, washed with hot water and ignited for 15 minutes at a temperature not exceeding $450^{\circ}$C the weight of the insoluble matter subtracted from the weight of the ash, the difference in weight represents the water soluble ash. Calculated the percentage of water-soluble ash with reference to the air-dried drug.

**Determination of extractive values**

Suitably weighed quantity of the air dried, crushed drug transferred extracted with various solvents in the order of increasing polarity. Filtered the extract quantitatively into a tarred evaporating dish and evaporated off the solvent on a water bath. The residue dried at 105ºC to constant weight. Calculated the percentage of extractive values with reference to the air-dried drug, for various solvents.

**Phytochemical study**

**Extraction of plant Materials- Cold extraction method**

Nearly 500 g of shade dried, coarsely powdered material was subsequently extracted with sufficient volume of various organic solvents in the order of increasing polarity and various extracts were subjected to preliminary phytochemical screening. All chemicals and solvents used for different studies were of analytical grade.

**Preliminary phytochemical screening of various extracts**

Preliminary phytochemical screening of various extracts was carried out as per the standard textual procedure for screening of saponins, tannins, steroids, terpenoids, flavonoids, alkaloids, and proteins etc.

**RESULT AND DISCUSSION**

Pyrostegia venusta commonly known as flame vine is a perennial climbing plant with tendrils used as ornamental due to showy orange inflorescences, and as medicinal for treating diarrhea and dysentery. Aiming to contribute to the knowledge of this medicinal plant, this work has dealt with the morpho-anatomical diagnosis of the leaf pharmacognostic purposes.

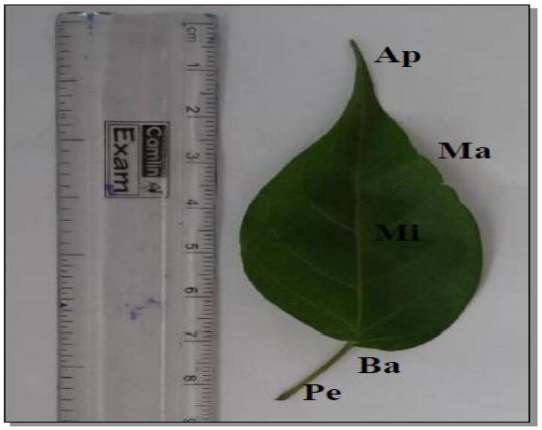


**Figure 3: *Pyrostegia venusta* leaf, Ap: Apex, Ma: Margin, Mi: Midrib, Ba: Base, Pe: Petiole.**

**Macroscopy:** Pyrostegia venusta is a fast-growing, evergreen woody vine that flourishes magnificent reddish orange flowers. The leaves are opposite, compound, two or three foliolate. The compound leaves have 5.1-7.6cm and are arranged in pairs opposite each other onthe stem. Often, the center leaflet is modified into acoiled, three-parted tendril. Flame vine branchesprofusely and climbs by clinging with its tendrils. The palmate-compound Pyrostegia venusta leaves found on stem are opposite/sub opposite. The margins of the leaves are entire, ovate, and evergreen, with pinnate venation. Leaf blade length extends from 2 to 4 inches.

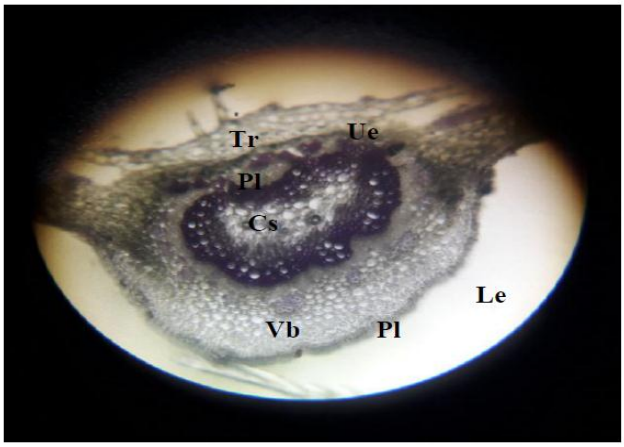


**Figure 4: T. S. of *Pyrostegia venusta* leaf, Tr: Trichome, Vb: Vascular bundle, Pl: Palisade cells, UE: Upper epidermis, Le: Lower epidermis, Cs: Crystal sheath.**

**Microscopy:** Samples of grown specimens were collected, fixed, free-hand sectioned and stained. Microchemical were conducted. The transverse section of the leaf shows isobilateral structure under microscope. The upper epidermis composed of the polygonal cells arranged. Mesophyll differentiated into palisade and spongy parenchyma.In the midrib at the center the vascular bundle with xylem and phloems are present. The epidermis is uniseriate, the stomata are anomocytic and occur on the abaxial side, and glandular and non-glandular trichomes are present. The mesophyll is dorsiventral. The midrib is plain-convex and traversed by one major collateral vascular bundle and about three minor bundles on the adaxial side, in centric arrangement and encircled by an incomplete sclerenchymatic sheath.

**UV fluorescence study:**

**Table 1: UV fluorescence study.**

| Test | In normal light | In UV light |
|---|---|---|
| Powder | Green | Black |
| Powder + 50% HNO3 | Brown | Black |
| Powder + Methanol | Green | Black |
| Powder + 5% KOH | Green | Black |
| Powder + Ethanol | Green | Black |
| Powder + 1N HCl | Green | Black |
| Treated with 1N NaOH | Green | Black |
| Treated with 80% $H_2SO_4$ | Dark Brown | Black |

**Physicochemical study**

Physicochemical characterization of Pyrostegia leaves powder is shown in Table 2. The physicochemical study is an important parameter in detecting adulteration or improper handling of drugs. As the leaf contained less moisture it would discourage bacterial and fungal growth. The percentage of loss on drying was found to be-0.6 $\pm$ 2.46%. The ash value was determined by three different forms viz., total ash, water soluble ash and acid insoluble ash.The percentage total ash was found to be-9.666 $\pm$ 7.35 %w/w. The percentage of water soluble ash obtained is 5.97 $\pm$ 2.46%. The percentage of acid insoluble ash is 2.3 $\pm$ 9.57%. The extractive value of leaves was found to be maximum in methanol solvent.

**Table 2: Physicochemical characterization of pyrostegia leaves powder.**

| Sr. no. | Parameters | Result (%w/w) |
|---|---|---|
| 1 | Loss on drying | 0.6 $\pm$ 2.46 |
| 2 | Total ash value | 9.666 $\pm$ 7.35 |
| 3 | Water soluble ash value | 5.97 $\pm$ 2.46 |
| 4 | Acid insoluble ash value | 2.3 $\pm$ 9.57 |
| 5 | Ether soluble extractive value | 1.98 $\pm$ 6.627 |
| 6 | Chloroform soluble extractive value | 3.52 $\pm$ 4.78 |
| 7 | Methanol soluble extractive value | 15.61 $\pm$ 2.56 |

**Table 3: Chemical tests performed for the chemical characterization of leaves extract.**

| Sr.no | Test | Petroleum Ether | Methanol |
|---|---|---|---|
| 1 | Test for Sterols<br>a. Salkowaski Test<br>b. Libermann Test | +ve | -ve |
| 2 | Test for Glycosides<br>a. β- naphthol Test | -ve | -ve |
| 3 | Test for Alkaloids<br>a. Dragendorff 's Test | -ve | +ve |
| 4 | Test for Triterpenoids<br>a. Libermann-Burchard Test | +ve | -ve |
| 5 | Test for Flavonoids<br>a. Shinoda Test | -ve | +ve |
| 6 | Test for Tannins<br>a. Ferric Chloride<br>b. Match Stick | -ve<br>-ve | +ve<br>+ve |
| 7 | Test for Carotenoids<br>a. Carr-price reaction | -ve | -ve |

**Table 4: Thin layer chromatography**.

| Sr. No. | Extract | Solvent System | Visualizing Agent | Number of Spots |
|---|---|---|---|---|
| 1 | Petroleum ether | Toluene: Acetone = 7:3 | Anisaldehyde-Sulphuric acid | 1 |
| 2 | Ethyl acetate | Chloroform: Ethyl acetate: Methanol = 4:3:3 | 10%H2SO4 | 3 |
| 3 | Methanol | Chloroform: Ethyl acetate: Methanol = 9:4:0.5 | 10%H2SO4 | 1 |

**Preliminary phytochemical screening:** Sterols and Triterpenoids were present in Petroleum Ether Extract. Alkaloids, Flavonoids and Tannins were present in Methanol Extract showed in table 3.

The chemical constituents present in the extract have been reported to possess many therapeutic values. Carbohydrates themselves have not been found to have therapeutic effect, but may possibly increase the effectiveness of the therapeutically important ingredients. Hence a better therapeutic effect may be obtained from the combination of active principles in each plant than by single isolated substance. Carbohydrates is recently employed in producing polysaccharide immunomodulator with therapeutic and vaccine implications.[15] Tannins can evoke an antidiarrheal effect and these substances may precipitate proteins on the enterocytes reducing peristaltic movement and intestinal secretion.[16] Saponins are glycosidic in nature and have expectorant and cardiotonic activity.Saponins have also been reported to have hypoglycemic and anti-diabetic effects which are very useful in the management of diabetes mellitus Saponins found in beans interfere with the replication of cell DNA, thereby preventing the multi-plication of cancer cells. Glycosides are known to have pronounced physiological action with cardiac glycosides being the drug of choice for the treatment of congestive heart failure. Furthermore, glycosides are known to have laxative, diuretic and antiseptic properties.[17] Flavonoids have attracted a great deal of attention due to their potential health benefits. Over the past few years, several experimental studies have demonstrated biological and pharmacological properties of many flavonoids especially their antimicrobial activity, anti-inflammatory, antioxidant and anti-tumour effects which are associated with free radical-scavenging action. Flavonoids have also been reported to possess hypoglycemic and anti-diabetic effect. Flavonoids have antioxidant activity, protect cells against oxidative damage and reduce the risk of developing certain types of cancers.[18]

## CONCLUSION

*Pyrostegia venusta* products or metabolites need evaluation on modern scientific lines based on various pharmacological activities. *Pyrostegia venusta* is a natural source of antioxidants and has been widely used in the traditional Brazilian medicine.The phytochemical scereening revealed the presence of tannins, saponins, glycosides and flavonoids which are compounds capable of causing varied physiochemical and pharmacological effects. Their presence therefore seems to support the traditional use of the plant in the management of various diseases. *Pyrostegia venusta* could be exploited as a potential source of pharmaceutical plant-based products. The current study could provide a sound basis for further research into the potential discovery of new natural bioactive compounds, and could provide preliminary information for future research. These data further support the view that the leaves of *Pyrostegia venusta* are promising sources of natural antioxidants, and could be seen as potential sources of useful drugs.

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