

Medicinal Properties of *Polyalthia longifolia* (Masquerade Tree)

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DOI: 10.56201/ijaes.v10.no5.2024.pg140.149

Abstract

Polyalthia longifolia(Sonn,) Thwaites (PL) (Family: Annonaceae) is a tall evergreen tree and it is cultivated all over India. The plant has been commonly used in traditional system of medicine for the treatment of fever, skin disease, diabetes, hypertension and helminthiasis. In view of the immense medicinal importance of *P. longifolia*, this review was aimed at compiling all currently available botanical, phytochemical, pharmacological, and toxicological and ethnomedical information on *P. longifolia*'s including its mechanisms of action. Information in the biomedical literature has indicated the presence of a variety of medicinally-important chemical constituents in *P. longifolia*. Pharmacological studies by various groups of investigators have shown that *P. longifolia* possesses significant biological and pharmacological activities, such as antibacterial, antifungal, antitumor, anti-ulcer and antioxidant properties. Beside this, toxicity studies of this plant have revealed no toxic effect on mice. *P. longifolia* can be considered as an ancient remedy to be explored for the development of various novel therapeutic agents.

INTRODUCTION

Medicinal plants play vital role in the sustainability of the human race in this earth planet. Plants continuously provide us oxygen for breathing, nutrient through edible plants and bioactive ingredients as medicine for our health through phytochemicals. Therefore we cannot deny the important role of the medicinal plant in human life especially the medicinal uses of plants, has provided many important drugs of modern day (John, 2021). Even at present day medicinal plants play important roles despite the tremendous scientific development and holds much more hidden treasure to be explored as almost 80% of the human population in developing countries is dependent on plant resources for their primary healthcare. (Farmsworth, 2021). Medicinal plants used in traditional medicine in developing countries contain a wide range of phytochemicals that can be used to treat chronic as well as infectious diseases in the treatment of present or future diseases (Altern, 2018). One such plant belonging to the genus *Polyalthia* and known to have curative value is *Polyalthia longifolia*(Sonn.), Thwaites (PL) from Annonaceae family.

Polyalthia is the Greek word for poly, meaning much or many and althia from àltheo, meaning to cure, which showed its multiple health benefit. The genus Polyalthia includes about 120 species occurring mainly in Africa, South and South-Eastern Asia, Australia, and New Zealand. *P. longifolia* is one of the most important indigenous medicinal plants in Indian medicinal Literature is found throughout Malaysia and widely used in traditional medicine as febrifuge and tonic. (Suthar, 2020).

BOTANY

Scientific Name: *Polyalthialongifolia*(Sonn.) Thwaites (PL).

Common Names: False Ashoka, Buddha Tree, Green champa, Indian mast tree, and Indian Fir tree.

Synonyms: *Uvarialongifolia* Sonn., *Guatterialongifolia* (Sonn.) Wallich, *Unonalongifolia* (Sonn.).



Polyalthialongifolia Tree



Polyalthialongifolia Tree showing the seeds

Classification of *Polyalthialongifolia*

Kingdom	Plantae
Division	Magnoliophyta
Class	Magnoliopsida
Subclass	Magnoliidae
Order	Mognoliids
Family	Annonaceae
Tribe	Annoneae
Genus	Polyalthia
Species	Longifolia

Distribution of *Polyalthialongifolia*

Native to India and Sri Lanka and it has been introduced in gardens of many tropical countries across the world.



Botanical Description of *Polyalthialongifolia*

Evergreen tree can grow up to a height of 15-20 meters tall. Young plant have straight trunks and weeping pendulous branch. The longest branch is seen at the base and shorter at the end of the trunk, giving an appearance of conical crown. Leaves are long, narrow dark green and glossy. Leaf blades are ovate-oblong to ovate-lanceolate with wavy margins. Reticulate veins rose on both surfaces of leaf. (Bunyapraphatsara, 2019). Transverse section of the leaf through the midrib showed bowl shaped abaxial parts and straight adaxial side. Petals are greenish yellow, narrowly triangular-lanceolate. Stamens are; connectives apically convex. Carpels are 20-25 in number with one ovule per carpel; stigmas are sessile. Fruits are borne in clusters of 10-20, usually ovoid in shape. Initially fruits are green in color but turns purple or black when ripe. Seeds are pale brown, ovoid, with a longitudinal groove. (Lemmens *et al.*, 2019).

Propagation of *Polyalthialongifolia*

It is generally propagated through seeds, but occasionally through soft wood cuttings and air layering.

ETHNOMEDICINAL USES OF POLYALTHIA LONGIFOLIA

Enthnobotany is a conception of conscientious use of natural resources. Ages ago, these resources had rendered the rudimentary essence of every medicinal folk culture throughout the world. In contemplating the folk culture, one should be able to translate, interpret, and amalgamate these

native concepts and beliefs pertaining to illness, its signs and symptoms. In uniformity, it may beget a better practical biomedical image of therapeutic study. (Elisabetsky, 2021). It follows that, the plant *Polyalthia longifolia* had long served the purpose of being medically important as per Ayurveda.

P. longifolia bark is the most common serving part of this plant as it had been used to treat pyrexia, rheumatism, menorrhagia, scorpion sting and diabetes, meanwhile the decoction is widely used for curing mouth ulcer in many parts of India. (Pradhan, 2021). For instance, the Eastern Ghats culture use the stem bark as a combination ingredient to *Sesamum indicum* and *Piper nigrum* seeds to treat bone fractures. Similarly, a different mixture of *Mimosa intsia* root bark, *Tridax procumbens* leaves and stem bark of *P. longifolia* is also prepared and bandaged daily till the fractures cured (Sunnetha et al., 2021). The bark is bitter, acrid, cooling and febrifuge. Beside from being a good febrifuge agent, it is believed also to relieve skin disease, hypertension, helminthiasis and vitiate conditions of vata and pitta. Likewise, the bark embraces the treatment for digestive system, constipation, circulatory system, urinary system, an antipyretic activity (Ferdaus et al., 2019). The Kavirajes also have an unfamiliar way in exerting the benefits from the roots of *P. longifolia*. The roots are cooperated with the roots of *Morinda citrifolia* and rhizomes of *Curcuma longa* for treating snake bites. Conterminously, healers from Syihet, Bangladesh accompany crushed leaves and barks of *P. longifolia* in recuperating coughs and mucus a whole, the plant had been traditionally used to lower blood pressure, stimulate respiration, and recover uterus ailment, gonorrhoea, leucorrhoea and menorrhagia. (Danlami, 2018).

PHARMACOLOGICAL ACTIVITIES OF POLYALTHIA LONGIFOLIA

Pharmacognostic studies and physicochemical properties of the *P. longifolia* leaf

Standardization of *P. longifolia* leaf was reported by (Dave et al., 2020) with respect to authenticity, macroscopic and microscopic, and physicochemical analysis. They had done various pharmacognostic studies including examinations of macroscopic and microscopic characters, and powder analysis were determined on leaf of *P. longifolia*. The physicochemical properties such as loss on drying, total ash value, acid insoluble ash value, water soluble ash value, pH, boiling point, melting point and extractive values of leaf were carried out, the solubility of methanolic extract of leaves was carried out in various polar and nonpolar solvents. Their studies provided crucial information for correct identification and standardization of *P. longifolia* leaf material (Yangnik, 2021).

Antibacterial Activity

The preliminary antibacterial activity of various solvent extract (petroleum ether, chloroform, ethyl acetate, ethanol and aqueous) of *Polyalthia longifolia* leaves was studied against six different bacteria by disc diffusion method. (Thenmozhi et al., 2021). The study revealed that all the extract possesses potent antimicrobials against all the test pathogenic organisms. The antibacterial activity was screened by measuring the zone of inhibition. Among various extracts, chloroform extract showed the higher degree of inhibition followed by ethyl acetate, ethanol, and petroleum ether. The

aqueous extract showed minimum inhibitory effect compared to all other extracts. The diameter of inhibition zones for each samples were compared with standard antibiotic positive control chloramphenicol (30mg/disc). In another study by (Uzama *et al.*, 2019), the antibacterial activity of methanolic leaf extract of *P. longifolia* showed highest degree of inhibition against *Bacillus subtilis* (24mm), which was comparable with standard positive control chloramphenicol (22.3mm) and ciprofloxacin (24mm) followed by *Staphylococcus aureus* (22.6mm). Meanwhile, the leaf extract did not show any inhibitory effect against *Klebsiella pneumonia* and *Escherichia coli*. In addition to the disc diffusion method the *P. longifolia* leaf extract was also further subjected to determine the Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC) to evaluate its potency as an antimicrobial agent. The leaf extract shows favourable antibacterial activity with Minimum Inhibitory Concentration (MIC) against *Bacillus subtilis* (0.01mg/ml) and *Staphylococcus aureus* (0.01mg/ml). Meanwhile, Minimum Bactericidal Concentration (MBC) of leaf extract was ranged between 0.01 and 1.3mg/ml. Apart from that, the stem bark of *P. longifolia* was also reported for its antibacterial activity against Gram positive and Gram negative bacteria. The inhibitory activity of the extract was compared with the standard antibiotics Ciprofloxacin, Roxithromycin and Cefuroxime. The extract shows significant antibacterial activity against all the tested bacteria which was suggested as potential antibacterial agent. In addition, (Chanda, 2018), also tested the methanol, acetone and 1,4-dioxan fractions of leaf of *P. longifolia* were evaluated for antibacterial and antifungal activity. They were used 91 clinically important strains for their study which were both clinical isolates as well as identified strains. They reported that the extract and fraction showed more pronounced antimicrobial activity against gram positive bacterial and fungal strains and poor activity was shown against gram negative bacterial strains studied. (Tripta *et al.*, 2019).

Antioxidant Activity

The in vitro antioxidant potential of ethanolic stem bark extract of *P. longifolia* was evaluated for its role on reactive oxygen species in tumor initiation and progression (Manjula, *et al.*, 2020). The extract scavenged DPPH radicals, reduced ferric ions and inhibited lipid peroxidation with IC₅₀ values of 18.14, 155.41 and 73.33 microg/ml, respectively. In addition, the methanolic stem bark extract of *P. longifolia* was evaluated for its radical scavenging potential. The extract at 100µg/ml concentration showed maximum scavenging of the radical cation in ABTS observed up to 54.79 % followed by scavenging of stable radical DPPH (75.36 %), Nitric oxide (57.25 %) and Super oxide dismutase (78.40 %) at the same concentration. The IC₅₀ values of this extract in these models were calculated as 77.07, 46.84, 88.54 and 40.91 respectively at 1mg/ml concentration. Another study by (Vijaya *et al.*, 2021), was to evaluate the antioxidant activity of seed extracts of *P. longifolia*. Petroleum ether, chloroform, methanol and aqueous extracts of seeds of *P. longifolia* were evaluated for preliminary antioxidant activity using DPPH and FRAP assays. Among the various extracts methanol and petroleum ether extracts showed good antioxidant activity with IC₅₀ 98.43 and 62.52 for DPPH assay while 1.40 and 0.81 for FRAP assays. Whereas, aqueous extract showed very low activity in both of the antioxidant assays tested. The antioxidant activity of ethanol extract of the seeds and leaves of *P. longifolia* was determined by measuring the radical scavenging activity against 2, 2 - Diphenyl - 1 - picrylhydrazyl radical

(DPPH). The highest radical scavenging effect was observed in leaves with IC_{50} 0.5824 mg/ml than in seeds with IC_{50} 1.4677 mg/ml. Phenolic compounds and flavonoid contribute to this activity (Mundhe, 2019).

Anti-Inflammatory Activity

The anti-inflammatory activity of various solvent extract (petroleum ether, hexane, toluene, chloroform, acetone and methanol) of *P. longifolia* leaf was evaluated using acute inflammatory studies in Wistar albino rats (Tanna, 2019). Methanolic extract revealed most potential anti-inflammatory effect hence; three doses of methanolic extract (300, 600, 900 mg/kg) were used to evaluate its potential as an anti-inflammatory agent. The three doses of methanolic extract showed anti-inflammatory activity comparable to that of the standard (Diclofenac sodium). Thus the results indicates the methanolic leaves extract of *P. longifolia* possess a significant anti-inflammatory activity. Another study by Sharma *et al.*, (2021), as evaluated the anti-inflammatory potential of ethanolic and aqueous extracts of *P. longifolia* leaf in albino Wister rats. Anti-inflammatory activity was also reported using Cotton pellet granuloma study which is a sub-acute anti-inflammatory model. Where the weight of cotton pellet was determined at the end of the study and the percentage decrease in granuloma tissue weight was also found out, **Anticancer Activity**

The in vitro and in vivo antitumor activity of ethanolic stem bark extract of *P. longifolia* was evaluated by (Manjula *et al.*, 2020). The extract was reported for in vitro cytotoxicity using murine cancer cells and human cancer cells by Trypan blue exclusion assay and MTT assay, respectively. The extract showed concentration-dependent cytotoxicity in Ehrlich's ascites carcinoma (EAC) and Dalton's ascites lymphoma (DLA) cells with IC_{50} values of 45.77 and 52.52 microg/ml, respectively. In the MTT assay, the IC_{50} values of extract against HeLa and MCF-7 cells were 25.24 and 50.49 mg/ml, respectively. The extract was further subjected for in-vivo antitumor activity against Ehrlich's ascites tumor and Dalton's solid tumor models by administering 50 and 100 mg/kg extract, i.p., for 7 consecutive days. Stem bark extract of *P. longifolia* at a dose of 100 mg/kg, significantly enhanced mean survival time (MST) and marginally improved hematological parameters when compared to EAC control mice. And the same dose significantly reduced the tumor volume as compared to control DLA inoculated mice. Positive control, cisplatin (3.5 mg/kg, i.p., single dose), significantly enhanced MST and improved hematological parameters when compared to EAC and significantly reduced the tumor volume when compared to DLA control. Apart from that, another study by (Rajesh *et al.*, 2022), was further evaluated the *P. longifolia* extract for its in vitro anticancer activity using various cancer cell lines namely HeLa-B75, HEP-3B and PN-15. The potential anticancer activity towards cancer cell lines determine based on IC_{50} values 68.22, 39.15 and 55.21 respectively (Verma *et al.*, 2018).

The extract on organ weight, biochemical and hematological parameters also were evaluated on the 15th day. They found that the methanol extract of *P. longifolia* leaf up to the dose level 3240 mg/kg body weight did not produce any toxic effect or death; the extract was well tolerated by the rats. They also reported that the extract did not alter body weight, feed and water consumption. The organ weight, biochemical and hematological analysis did not show any dose

dependent changes in are administered orally (p.o.) five different dose levels of *P. longifolia* leaf extract to the animals. The 5 dose levels studied were 400mg, 800mg, 1200mg, 1600mg and 3200mg/kg. From safety assessment in acute condition and gross behavioral studies it is concluded that all extracts produced mild to moderate hypo activity and also exhibited analgesic activity to some extent. They concluded that crude powder and the extracts of *P. longifolia* leaf are considered as safe in acute condition up to 3.2g/kg dose level. Furthermore, (Shazidet *al.*, 2018).

Precautions/Safety for Usage

Although medicinal plants are natural, and some have been in use for thousands of years in the traditional medicinal practices, this does not necessarily mean that they are always safe and without side effects (Nair, 2019). Therefore the safe use of the medicinal plants is of major importance since many herbal plants are self-prescribed and patients usually do not inform their doctors that herbal medicines are being consumed. Hence, the consumer should tell their doctor that they may be considering using *P. longifolia* preparations. In addition, the consumer also must always tell their doctor when and why they have stopped taking an herbal medicine, especially if it is due to allergic or adverse reaction. Moreover, precautions should be taken to ensure collection of *P. longifolia* that has not been sprayed with weed killer. The samples are to be washed thoroughly or soaked with water to remove unwanted pollution (Chanda, 2018).

CONCLUSION

In this review, *Polyalthialongifolia*, a medicinal herb used in the traditional medicine and an ancient remedy to be explored for novel therapeutic uses. The survey of the literature revealed the presence of various phytochemicals in *P. longifolia*, which will be lead compound for novel therapeutic agents. It also revealed a broad spectrum of pharmacological activities and traditional uses of the *P. longifolia*.

RECOMMENDATIONS

Since the plant has been commonly used in traditional system of medicine for the treatment of skin disease, diabetes, hypertension and heirinthisis, this study therefore recommend the following:

- i. There should be awareness for cultivation of *Polyalthialongifolia*.
- ii. Seminars and workshop should be conducted in order to create awareness to the use and benefits of *Polyalihialongifolia*.
- iii. Government should encourage and support the cultivations of medicinal plants in large scale, so to have it much available.
- iv. *P. Longifolia* when cultivated in large quantities could be exported such as other medicinal plants.

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