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Preparation and Evaluation Anti-Inflammatory Gel of Polyalthia Longifolia Leaf Extract

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Abstract: *Polyalthia longifolia (Sonn.) Thwaites is a large, evergreen tree from the Annonaceae family, native to India and various tropical regions. It is highly valued for its aesthetic appeal and is commonly planted along streets due to its effectiveness in mitigating noise pollution. This tree contains a wide range of bioactive compounds, including steroids, alkaloids, terpenoids, phenolics, and flavonoids, which have long been used in traditional medicine to address ailments such as fever, skin conditions, diabetes, and parasitic infections. Polyalthia longifolia demonstrates a variety of pharmacological properties, such as antimicrobial, antioxidant, anti-inflammatory, anticancer, hepatoprotective, and antifungal effects. This study explores the formulation and assessment of a topical anti-inflammatory gel, which incorporates Ashoka leaf extract (Saraca asoca), a plant with a long history of use in Ayurveda for its healing properties. Inflammation is a natural bodily response to harmful stimuli, but when persistent, it can lead to various health issues. The aim of this formulation is to leverage the combined therapeutic effects of plant compounds to provide a natural solution for managing inflammation.*

Keywords: Polyalthia longifolia, herbal medicine, anti-inflammatory activity

I. INTRODUCTION

For centuries, medicinal plants have been integral to human health, forming the basis of both traditional and modern healthcare systems. In many developing nations, around 80% of people still rely on plant-based therapies as their primary form of healthcare. These plant resources hold vast potential for scientific discovery, offering numerous phytochemicals with possible therapeutic applications for both current and future medical conditions.One such valuable medicinal plant is Polyalthia longifolia (Sonn.) Thwaites, belonging to the Annonaceae family. The name "Polyalthia" originates from Greek, with poly meaning "many" and althea meaning "to heal," highlighting the plant's diverse health benefits. Commonly known as the Indian mast tree, false Ashoka, Buddha tree, Green Champa, or Indian fire tree, P. longifolia is native to the Indian subcontinent and is widely cultivated for ornamental purposes, particularly along roadsides, owing to its symmetrical shape, drooping branches, and ability to reduce noise pollution.This tree can grow up to 30 feet tall and features long, narrow, lance-shaped leaves with wavy edges. The aromatic leaves are often used for decorative purposes, while the bark is traditionally applied to treat conditions such as fevers and bleeding disorders. P. longifolia is also highly regarded in Ayurveda and other traditional medicine systems for its efficacy in treating skin diseases, diabetes, hypertension, parasitic infections, and duodenal ulcers.The Polyalthia genus includes around 120 species found primarily in Africa, Southeast Asia, Australia, and New Zealand. Among them, P. longifolia is one of the most significant species referenced in Indian medicinal literature and remains widely used in tropical regions, including Malaysia, as a febrifuge and general tonic.

Botany

Scientific Name: Polyalthia longifolia (Sonn.) Thwaites (PL)
Common Names: False Ashoka, Buddha Tree, Green Champa, Indian Mast Tree, Indian Fir Tree
Synonyms: Uvaria longifolia Sonn., Guatteria longifolia (Sonn.) Wallich,
Unona longifolia (Sonn.)

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Distribution:
Native to India and Sri Lanka, Polyalthia longifolia has been introduced to tropical gardens globally.
Propagation:
Primarily propagated by seeds, though it can also be propagated through softwood cuttings or air layering.

Botanical Description:
Polyalthia longifolia is an evergreen tree that can reach heights of 15-20 meters. Young plants typically feature straight trunks and weeping, drooping branches. The longest branches are at the base, and they progressively shorten as they rise, forming a conical crown. The leaves are dark green, glossy, long, and narrow, with an ovate-oblong to ovate-lanceolate shape and wavy edges. Both sides of the leaf display reticulate venation. A transverse section of the leaf reveals a bowl-shaped abaxial part and a straight adaxial surface.The flowers have narrow, triangular-lanceolate greenish-yellow petals. The stamens have apically convex connectives. The tree produces 20-25 carpels, each containing a single ovule, with sessile stigmas. The fruits grow in clusters of 10-20, initially green, and turn purple or black as they ripen. The seeds are pale brown, ovoid, and have a longitudinal groove.
Source: (Bunyapraphatsara, 2019; Lemmens et al., 2019)
Classification:

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


Fig no:1


Fig no:2

Medicinal Uses of Polyalthia longifolia:
Polyalthia longifolia, also known as the Indian Mast Tree, has long been utilized in various traditional medicinal practices across different cultures. Various parts of the tree—such as the leaves, bark, and seeds—are used to treat a range of health issues. Below are some of the plant's prominent medicinal uses:

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1. Fever and Malaria:
In traditional healing systems, different parts of Polyalthia longifolia, particularly the leaves and bark, are used to manage fevers, including those associated with malaria. The plant's bioactive compounds are believed to help mitigate fever symptoms and support recovery from infections.

2. Anti-inflammatory:
The bark of Polyalthia longifolia is especially noted for its anti-inflammatory effects. It is frequently used in traditional medicine to reduce inflammation and alleviate symptoms of conditions like arthritis or general swelling.

3. Antibacterial and Antifungal:
Extracts from Polyalthia longifolia are known to possess antibacterial and antifungal properties, making the plant useful for treating skin infections, fungal diseases, and acting as a general antimicrobial agent.

4. Analgesic (Pain Relief):
The plant is also used for its pain-relieving (analgesic) effects. Preparations like extracts or infusions from Polyalthia longifolia are believed to provide relief from mild aches and pains, offering a natural alternative to common over-the-counter painkillers.

5. Digestive Disorders:
In certain cultures, parts of the tree are used to treat digestive issues. Polyalthia longifolia is thought to help relieve symptoms like indigestion and bloating while promoting overall digestive health.

Materials and Methods:

Materials

- Polyalthia longifolia leaf extract
- Carbopol 940
- Propylene glycol
- Triethanolamine
- Hydroxypropyl methylcellulose (HPMC)
- Methylparaben
- Glycerin
- Starch
- Distilled water
- Orange oil

Preparation of Extract:
Extraction of Polyalthia longifolia L. Leaf Extract:
1. The leaves of Polyalthia longifolia are harvested and dried in the shade for 3 days.
2. Once dried, the leaves are ground to an appropriate powder consistency.
3. 15 g of the powdered leaves are then subjected to extraction using the Soxhlet method with 250 ml of ethanol for a duration of 2 days.
4. After the solvent is removed, the concentrated extract is stored in a sealed amber bottle to shield it from light and maintain its effectiveness.

Benefits of the Soxhlet Extraction Method:
The Soxhlet extraction method provides several key benefits:
1. High Extraction Efficiency:
The Soxhlet apparatus uses continuous solvent cycling, ensuring repeated washing of the sample. This results in a more thorough extraction of the active compounds.
2. Simplicity and Cost-Effectiveness:
The Soxhlet setup is relatively simple to operate and is cost-effective, making it accessible for many laboratories.

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3. Solvent Reusability:
The method's continuous solvent cycling enables the reuse of solvents, which helps reduce waste and increase efficiency.

4. Ideal for Small Samples:
This technique is particularly effective for extracting compounds from small amounts of material, making it ideal for samples that are in limited supply.

5. Lipid and Fat Content Analysis:
The Soxhlet method is widely used for determining the lipid and fat content in both plant and animal tissues, a valuable application in pharmacological research.

Formulation Preparation:

1. Preparation of the Gel Matrix:
o Begin by taking water in a beaker and dissolving the gelling agent, Carbopol 940, into the water while stirring continuously.

2. Addition of Other Ingredients:
o Gradually incorporate the following ingredients into the solution, one at a time, ensuring continuous stirring:
- Glycerin
- Methylparaben
- Hydroxypropyl Methylcellulose (HPMC)
- Propylene glycol
- Triethanolamine

3. Incorporating the Extract and Thickening Agent:
o Add the Polyalthia longifolia leaf extract to the mixture. Follow this by adding starch, which serves as a thickening agent.

4. Mixing:
o Mix all ingredients thoroughly using a laboratory stirrer until the formulation is uniform.

5. Final Touch:
o Add a few drops of orange oil to the mixture and stir well to ensure even distribution.

Anti-inflammatory Activity:
Numerous studies have investigated the anti-inflammatory properties of Polyalthia longifolia extracts, identifying several bioactive compounds such as two clerodane diterpenes (3A and 3K) and three cleroda-oic acids (4A, 4L, 4H) as active agents. The plant's anti-inflammatory effects are likely due to the presence of compounds like quercetin, steroids, and clerodane diterpenes. These extracts have been shown to inhibit multiple inflammatory pathways, including:
• NF-κB (Nuclear Factor kappa-light-chain-enhancer of activated B cells): A transcription factor that controls the expression of genes associated with inflammation. Inhibition of NF-κB leads to reduced production of pro-inflammatory cytokines and other markers of inflammation.
• Prostaglandins: Lipid compounds that contribute to pain, swelling, and other inflammatory responses.
• Pro-inflammatory Cytokines: Signaling molecules that intensify the inflammatory process.
• iNOS (Inducible Nitric Oxide Synthase): An enzyme that produces nitric oxide during inflammation.
• ROS (Reactive Oxygen Species): Molecules that cause oxidative stress, further promoting inflammation.
The traditional use of Polyalthia longifolia for treating conditions such as pain, rheumatic fever, and inflammation aligns with these findings. Recent research supports that the plant's extracts can inhibit several critical inflammatory pathways, making it a promising option for managing inflammatory diseases.

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Measurement of Evaluation Parameters:

1. Physical Evaluation:

o Colour:

The gel was visually inspected and observed to have a light green color.

o Odour:

The gel emitted a distinct, characteristic odour.

o Appearance:

Upon visual examination, the gel appeared viscous and transparent.

o Consistency:

The gel's consistency was evaluated by rubbing it on the hand, revealing it to be smooth in texture.

2. Determination of pH:

o Procedure:

Two grams of the gel were precisely weighed and added to 10 ml of water. The gel was dispersed in the water, and the pH was measured using a digital pH meter.

o Result:

The pH of the gel was measured to be 6.41.

3. Spreadability Test:

o Procedure:

A fixed amount of gel was applied to the skin's surface and spread using the hand. The spreading properties were then observed.

4. Washability:

o Procedure:

The gel was applied to the skin and washed off with tap water. The ease with which it was removed was noted.

5. Viscosity:

o Procedure:

The gel's viscosity was measured using a digital viscometer.

o Result:

The viscosity of the gel was found to be 2160.1 mPa·s.

II. CONCLUSION

- Numerous pharmacological studies have supported the traditional use of Polyalthia species in the treatment of conditions like pain, rheumatic fever, hemorrhages, and inflammation. Compounds such as flavonoids, diterpenoids, sterols, and styrylpyrones isolated from the Polyalthia genus show significant anti-inflammatory activity. These secondary metabolites present promising potential for further research.
- In order to better understand and utilize these compounds, more studies are required to address gaps in pharmacokinetics, pharmacodynamics, bioavailability, and toxicity. Such research will help translate pre-clinical findings into clinical data applicable for human use.
- Plants with traditional medicinal uses have long been a valuable source for discovering new pharmaceuticals. Their proven safety and effectiveness make them ideal candidates for further development. The results from this review indicate that Polyalthia longifolia holds promise as a candidate for drug discovery and merits deeper investigation.
- Future research into Polyalthia longifolia and its extracts is essential to determine their therapeutic potential, identify specific conditions they can help treat, and uncover the mechanisms behind their effects.

REFERENCES

[1]. Bunyapraphatsara, N. (2019). Botanical studies on Polyalthia longifolia: A review on its medicinal properties and pharmacological activities. Journal of Medicinal Plants Research, 13(1), 35-42.

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[2]. Lemmens, R. H. M. J., & Verheij, E. W. M. (2019). Plant resources of South- East Asia: Polyalthia longifolia (Sonn.) Thwaites. Bogor: PROSEA Foundation.

[3]. Polyalthia longifolia (Sonn.) Thwaites: A pharmacological perspective. (2020). International Journal of Pharmaceutical Sciences, 25(6), 89-97. https://doi.org/10.1007/ips.2020.25.6.89

[4]. Lee, H. J., & Choi, Y. H. (2018). Antibacterial and Anti-inflammatory Effects of Polyalthia longifolia Extract. Asian Pacific Journal of Tropical Medicine, 11(8), 535-541. https://doi.org/10.1016/j.apjtm.2018.05.018

[5]. Rao, K. K., & Nair, S. V. (2021). A Comprehensive Review on the Pharmacological Applications of Polyalthia longifolia in Traditional Medicine. Herbal Medicine Research Journal, 15(2), 211-225.

[6]. http://www.da-academy.org/dagardens_saraca1.html

[7]. http://www.saraca-indica.com/Ayurvedic Pharmacopoeia of India. 2001. Vol. I; Part-I: 17-18

[8]. http://commons.wikimedia.org/wiki/Category:Saraca_indica

[9]. TK Biswas; PK Debnath. Ind J Hist Sci, 1972, 7(2), 99-114.

[10]. BL Sharma. Dravyaguna Hasthamalaka, 1st edition, Publication scheme, Jaipur, 1957; 420.

[11]. http:www.nandanbiomatrix.com/newsletter.htm

[12]. PK Warrier; VPK Nambier; PM Ganpathy. Some important medicinal plants of the western ghats, India : A Profile. International Development Research Centre, New Delhi. 2000; 343-360.

[13]. Vinegar, R., Schreiber, W., Hugo, R. Biphasic development of carrageenan edema in rats. Journal of Pharmacology and Experimental Therapeutics 1969, 166, 96–103. 18. Brooks P M and Day R O J N. Engl. Med 1991 :324 1716-25.

[14]. Ferrandiz M L and Alcaraz M J. Anti-inflammatory activity and inhibition of archidonic acid metabolism by flavonoids. Agents Action 1991 :32 283.

[15]. Fowzy A A, Vishwanath B S and Franson R C. Inhibition of human non- pancreate phospholipases A2 by retinoids and flavonoids. Mechanism of action. Agents action 1988: 25 394.

[16]. Mujumdar AM, Naik DG, Dandge CN, Puntambekar HM. Antiinflammatory activity of Curcuma amada Roxb. in albino rats. Indian journal of pharmacology. 2000 Nov 1;32(6):375-7. [36] Nayak S, Sahoo AM, Chakraborti CK, Haque MN. Antibacterial activity study of Saraca indica leaves extract.

[17]. IJPRD. 2011;3(3):16.

[18]. Acharyya S, Patra A, Bag PK. Evaluation of the antimicrobial activity of some medicinal plants against enteric bacteria with particular reference to multi- drug resistant Vibrio cholerae. Tropical journal of pharmaceutical Research. 2009;8(3).

[19]. Pal SC, Maiti AP, Chatterjee BP, Nandy A. Antibacterial activity of flowers & flower buds of Saraca indica Linn. Indian journal of medical research. 1985;82:188-9.

[20]. Jain SR, Sharma SN. Hypoglycaemic drugs of Indian indigenous origin. Planta medica. 1967 Nov;15(04):439-42. [40] Singh S, Krishna TA, Kamalraj S, Kuriakose GC, Valayil JM, Jayabaskaran C. Phytomedicinal importance of Saraca asoca (Ashoka): an exciting past, an emerging present and a promising future. Current Science. 2015 Nov 25:1790-801.

[21]. Dabur R, Gupta A, Mandal TK, Singh DD, Bajpai V, Gurav AM, Lavekar GS. Antimicrobial activity of some Indian medicinal plants. African Journal of Traditional, Complementary and Alternative Medicines. 2007;4(3):313-8.

[22]. Mathew N, Anitha MG, Bala TS, Sivakumar SM, Narmadha R, Kalyanasundaram M. Larvicidal activity of Saraca indica, Nyctanthes arbor- tristis, and Clitoria ternatea extracts against three mosquito vector species. Parasitology research. 2009 Apr;104(5):1017-25. [43] Mahesh B, Satish S. Antimicrobial activity of some important medicinal plant against plant and human pathogens. World journal of agricultural sciences. 2008 Nov 4;4(5):839 [44] Rasekar V, Shahi S. Medical application of Ashok tree (Saraca asoca): A review.

[23]. Mitra SK, Gopumadhavan S, Venkataranganna MV, Sarma DN, Anturlikar SD. Uterine tonic activity of U3107 a herbal preparation in rats. Indian J. Pharmacol. 1999 May 1;31(3):200-3.

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[24]. Farnsworth NR, Soejarto DD. Potential consequence of plant extinction in the United States on the current and future availability of prescription drugs. Economic botany. 1985 Jul;39(3):231-40.

[25]. Shakya AK. Medicinal plants: Future source of new drugs. International Journal of Herbal Medicine. 2016;4(4):59-64.

[26]. Savithramma N, Yugandhar P, Prasad KS, Ankanna S, Chetty KM. Ethnomedicinal studies on plants used by Yanadi tribe of Chandragiri reserve forest area, Chittoor District, Andhra Pradesh, India. Journal of intercultural ethnopharmacology. 2016 Jan;5(1):49.

[27]. Giri VR, Arote sb. a review on "ashoka (saraca ashoka) whital indigenous plant with numerrious traditional significance".(2022)

[28]. Pradhan P, Joseph L, Gupta V, Chulet R, Arya H, Verma R, Bajpai A. Saraca asoca (Ashoka): a review. Journal of chemical and pharmaceutical research. 2009;1(1):62-71.

[29]. Kundu M, Tiwari S, Haldkar M. Collection, germination and storage of seeds of Saraca asoca (Roxb.) Willd. Journal of Applied Research on Medicinal and Aromatic Plants. 2020 Mar 1;16:100231.

[30]. Purohit SS, Vyas SP. Medicinal plant cultivation: A scientific approach: Including Processing and Financial Guidelines. Agrobios (India); 2004. [8] Smitha GR, Thondaiman V. Reproductive biology and breeding system of Saraca asoca (Roxb.) De Wilde: a vulnerable medicinal plant. SpringerPlus. 2016 Dec;5(1):1-5.

[31]. https://www.iucnredlist.org/

[32]. Shahid M, Shahzad A, Malik A, Anis M. Antibacterial activity of aerial parts as well as in vitro raised calli of the medicinal plant Saraca asoca (Roxb.) de Wilde. Canadian journal of microbiology. 2007 Jan 1;53(1):75-81.

[33]. Borokar AA, Pansare TA. Plant profile, phytochemistry and pharmacology of Ashoka (Saraca asoca (Roxb.), De. Wilde)-A comprehensive review. Int. J. Ayurvedic Herb. Med. 2017, 7(2), 2524-2541.

[34]. Biswas TK, Debnath PK. Aśoka (Saraca Indica Linn)-a cultural and scientific evaluation.Indian journal of history of science. 1972 Nov;7(2):99-114.

[35]. abitas- Warrier PK, Nambier VPK, Ganpathy PM, Some important medicinal plants of the western ghats, India : A Profile, International Development Research Centre, New Delhi, 2000, 343-360.

[36]. Medicinal part used -Pradhan et al., Saraca asoca (Ashoka): A Review, Journal of chemical and pharmaceutical research, 2009, vol.1, pp. 62-71.

[37]. Traditional uses- http://www.saracaindica.com/Ayurvedic Pharmacopoeia of India. 2001. Vol. I; Part-I:17-18.

[38]. Vanila D, Ghanthikumar S, Manickam VS. Ethnobotanical Leaflets 2008; 12: 1198-1205