

AN OVERVIEW OF ANTI-INFLAMMATORY POTENTIAL OF *FLUEGGEA LEUCOPYRUS*.

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ABSTRACT :

This study explores the anti-inflammatory capabilities of *Flueggea leucopyrus*, a plant rich in bioactive phytochemicals such as flavonoids, alkaloids, tannins, saponins, and phenolics. These natural constituents contribute to the plant's potential to combat inflammation and oxidative stress. Experimental rat models exhibited reductions in inflammatory markers and edema upon treatment with its extracts, supporting its traditional use in managing wounds, digestive ailments, and uterine health. The investigation also emphasizes the safety profile of *Flueggea leucopyrus*, showing no toxic effects at therapeutic doses. Given the increasing demand for herbal alternatives with minimal adverse effects, *Flueggea leucopyrus* presents as a promising candidate for developing novel anti-inflammatory treatments. This research underscores the plant's pharmacological prospects and encourages further studies to validate its clinical applications and integration into contemporary drug delivery modalities.

KEYWORDS :

Flueggea leucopyrus, anti-inflammatory activity, phytochemical constituents, traditional medicine, flavonoids, phenolic compounds, herbal therapeutic agents, oxidative stress.

INTRODUCTION:

The anti-inflammatory potential of *Flueggea leucopyrus* has gained significant attention in recent pharmaceutical research due to its promising therapeutic effects. Inflammation is a complex biological response to harmful stimuli such as pathogens, damaged cells, or irritants, characterized by redness, swelling, pain, and loss of function. While inflammation is a protective mechanism essential for tissue repair, chronic or excessive inflammation can lead to serious health issues including arthritis, cardiovascular diseases, and autoimmune disorders. Therefore, anti-inflammatory agents play a vital role in medicine by controlling and reducing inflammation to

prevent tissue damage and promote healing.Traditional medicine has long **used *Flueggea leucopyrus***, a plant known for its rich phytochemical composition, which includes flavonoids, saponins, alkaloids, tannins, and phenolics. These bioactive compounds contribute to its anti-inflammatory and antioxidant properties, making it a valuable natural remedy for inflammatory conditions. Experimental studies using rat models, such as carrageenan-induced paw edema and Freund's complete adjuvant induced arthritis, have demonstrated that extracts of ***Flueggea leucopyrus*** significantly reduce inflammation by lowering pro-inflammatory markers like TNF- α and IL-6, as well as oxidative stress indicators(1,2).The purpose of this review is to provide a comprehensive overview of the anti-inflammatory potential of ***Flueggea leucopyrus*** by examining its phytochemical profile, mechanisms of action, and pharmacological activity. This review aims to highlight its role as a natural anti-inflammatory agent and explore its potential applications in the development of herbal therapeutics and modern drug delivery systems.

Medicinal uses:

- Wound healing: Used to treat cuts, wounds, and ulcers, helping them heal faster.
- Anti-inflammatory: Helps reduce swelling and pain in inflammatory conditions.
- Cancer treatment: Traditionally used to fight cancer and tumors.
- Digestive issues: Used for stomach problems, ulcers, and intestinal worms.
- Uterine health: Used in women to help with uterine fibroids and related issues.
- Liver health: Used to support liver health and treat liver-related diseases.
- Hemorrhoids: Helps reduce swelling and pain related to hemorrhoids1.
- Antioxidant properties: Protects cells from damage caused by oxidative stress.

PLANT PROFILE :

Taxonomy :

Kingdom	Plantae
Phylum	Tracheophyte
Class	Equisetopsida
Order	Malpighiales
Family	Phyllanthaceae
Genus	Flueggea
Species	<i>Fluggea leucopyrus</i>

Common Names :

English	• Spinous fluggea
Hindi	• Hartho • ऐटं ाट Ainta
Konkani	• Parpo
	• Perimklavu Vellamullaram • ചെറു ാട ാട ക്ലറവ് Cerimklaav
Marathi	• प ांढरफळी Pandharphali

Sanskrit	- प ण्डुफली Panduphali - भूरफली Bhuriphali
Other	- Bushweed - Cool Pot
	- Indian Snow Berry - Pulanji - Thermacole Plant - White Honey Shrub

DESCRIPTION:

Leaf :

Leaves are alternate, obovate to elliptic, measuring up to 2.5 cm long and 1.5 cm wide, with a smooth margin and thin, hairless (glabrous) blade (5,6). The upper surface of leaves is dark green while the underside is paler (6). Leaves are simple, with a prominent central vein and an obtuse apex (6).

Stem :

The plant is a much-branched erect shrub, with angular, slender branches often ending in sharp spines (5,6). Young stems are green and smooth, while older stems become grayish brown and woody (6). Stems display a zigzag pattern, giving the shrub a bushy, tangled appearance (6).

Bark :

Bark is thin and smooth in young plants, becoming rough and fissured as the plant age (7). The bark is gray to brown in color and may exude a latex-like substance when cut (7).

Roots :

Roots are moderately deep and fibrous, providing strong anchorage in dry, rocky soils (8).The external surface is brown, while the interior is white and bitter in taste (8).Roots are a significant source of phytochemicals and are used in various pharmacological preparations (8).



Fig no.1 Leaves of *Flueggea leucopyrus*



Fig no.2 Fruit of *Flueggea leucopyrus*

Fig no.3 Leaf of *Flueggea leucopyrus*



MATERIALS & METHODS:

Collection And Processing Of Material:

The leaves were collected and cut into small pieces and then dried in shade until the fracture is uniform and smooth. The dried leaves were powdered by using a blender and pass through sieve no 60(9). The coarse powder 500 gm was subjected to maceration for 72 hours, followed by exhaustive maceration for 48 hours by using ethanol as a solvent by decanting and drying the marc after extraction. The solvent was recovered by distillation of the extract at 75°C to 85°C. The extract was dried under desiccator and the Percentage yield was calculated. The residues obtained were used for the screening of the phytochemical analysis. The Ethanolic extract was used for the preliminary phytochemical investigation, chromatographic analysis and its pharmacological evaluation (10).

PHYTOCHEMICAL ANALYSIS OF *FLUEGGEA LEUCOPYRUS*

EXTRACTS LEAVES:

Screening Of Alkaloids: (Mayer's reagent tests) The identification of alkaloids was carried out using the Mayer's test. A portion of the plant extract was mixed with 5ml of sulphuric acid in 50% ethanol. 1ml of Mayer's reagent was added drop by drop. The formation of a greenish color or cream precipitate indicated the presence of alkaloids (11).

Screening Of Flavonoids: (Sodium hydroxide test) 5ml of plant extract was mixed with few magnesium chips and 2 drops of concentrated hydrochloric acid were added and warmed. The presence of a pink/red color indicated the presence of flavonoids (12).

Screening Of Tannins: (Bromine Water test) 5 ml of plant extract was extracted with 20ml of 50% alcohol and then filtered. A few drops of bromine water were added to the resulting filtrate. The formation of a buff/white precipitate indicated the presence of tannins (13).

Screening Of Terpenoids: 5 ml of extract was taken in a test tube and 2ml of chloroform was added to it followed by the addition of 3ml of concentrated sulphuric acid. Formation of reddish brown layer at the junction of two solutions confirms the presence of terpenoids (14).

Screening Of Saponin: (Frothing test) 3 ml of the plant extract was added to 10ml distilled water and shaken vigorously for 30 seconds. Froth formation indicates the presence of saponins (14).

Screening Of Phenolic Compound : 1 ml of the filtrate of leaves extract was taken. Few drops of 5% Ferric chloride solution were added. The dark bluish black colour provides the positive result of the test of phenolic compounds (11).

Screening Of Glycosides: 2 ml of chloroform, 2 ml of acetic acid were added to plant extract and allowed to cool, followed by addition of 2ml of concentrated H₂SO₄ changes the violet to blue then green, indicates the presence of steroidal nucleus that is glycone portion of glycoside (12).

Screening Of Carbohydrate: (Molisch test) Filtrate was treated with 1 drop of Molisch reagent and add 2ml of con.HCl was added from the side of test tube. The test tube was observed for formation of violet ring at the junction of two solutions indicated that presence of carbohydrates. (Fehling test) Equal volume of Fehling's reagent A and B mixed together and 2ml of Mixture was added to plant extracts followed gentle heat, the mixture turned Brick red color (11).

Screening Of Reducing Sugar: 1 ml of the extract was added with 2ml of Fehling's reagent and 3ml of water. It was then boiled for 2 minutes (13).

Table.1. Results of phytochemical constituents

PHYTOCHEMICAL TEST	WATER	PETROLIUM ETHER	CHLOROFORM	ETHANOL
Alkaloides	+	-	-	+
Glycosides	+	+	+	+
Saponin	-	+	+	-
Steroides	+	+	+	+
Flavonoids	-	-	-	-
Terpenoids	+	-	+	+
Tanins	+	-	-	+
Carbohydrates	-	+	-	-

- + Symbol indicates the presence of phytochemicals.
- - Symbol indicates the absence of phytochemicals.

Table:2 Quantitative Estimation Of Minerals In *Flueggea Leucopyrus* :

Sr.No	Name of the Parameters	Leaves	Stem	Root
1	Moisture (%)	5.48	5.78	5.49
2	Organic Carban (%)	11.29	11.58	11.32
3	Total Nitrogen (%)	1.28	1.21	1.23
4	Total Phosphorus (%)	0.34	0.25	0.26
5	Total Potasssium (%)	3.12	3.25	3.29
6	Total Sodium (%)	0.05	0.12	0.16
7	Total Sodium (%)	4.29	4.12	4.16
8	Total Magnesium (%)	4.06	4.26	4.28
9	Total Sulphur (%)	0.52	0.59	0.61
10	Total Zinc (ppm)	7.25	0.64	7.68
11	Total Copper (ppm)	0.65	0.72	0.74
12	Total Iron (ppm)	80.12	81.26	82.16
13	Total Manganese (ppm)	51.16	52.06	52.18
14	Total Boron (ppm)	0.50	0.55	0.54
15	Total Molybdenum (ppm)	0.02	0.02	0.02

Table 3: Quantitative estimation of phytochemical constituent in *Flueggea leucopyrus* :

Sr.No	Phytoconstituents	Leaves	Stem	Root
1	Total Alkaloids (mg kg-1)	2.52	2.48	2.52
2	Total Flavonoids (mg kg-1)	2.89	2.90	2.92
3	Tannin (mg kg-1)	0.55	0.52	0.56
4	Lignin (mg kg-1)	0.31	0.29	0.26
5	Glycosides (mg/ kg-1)	0.10	0.03	0.03
6	Serpentines (mg/ kg-1)	0.05	0.02	0.021
7	Phenol (mg/ kg-1)	2.11	3.46	1.94

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PHARMACOLOGICAL ACTIVITIES:

Antioxidant Properties: *Flueggea leucopyrus* is noted for its antioxidant effects, which help in neutralizing free radicals, thereby reducing oxidative stress and potentially lowering the risk of chronic diseases.

Antimicrobial Activity: The plant's extracts have shown activity against a variety of bacterial and fungal pathogens, which suggests its potential as a natural antimicrobial agent.

Anti-inflammatory Effects: Anti-inflammatory properties of *Flueggea leucopyrus* indicate its use in combating inflammatory conditions by possibly modulating specific signaling pathways.

Cytotoxic and Anticancer Potential: There is evidence of *Flueggea leucopyrus* exhibiting cytotoxic effects that inhibit tumor cell growth, suggesting anticancer potential through mechanisms such as inducing apoptosis in cancer cells.

Antidiabetic Effects: While specific studies on *Flueggea leucopyrus* are limited, related compounds have shown promise in managing blood glucose levels, indicating potential antidiabetic properties.

TOXICOLOGICAL RESERCH STUDY :

Toxicological research on *Flueggea leucopyrus* related to its anti-inflammatory potential indicates that the plant's extracts are generally safe and show no significant toxic effects at doses effective for reducing inflammation. Experimental studies in rats have tested *Flueggea leucopyrus* leaf extract at doses up to 500 mg/kg, demonstrating substantial anti-inflammatory activity without observable toxicity or adverse behavioral effects.

Key toxicological findings include:

- No signs of acute toxicity or mortality were observed in rats treated with the extract during anti-inflammatory experiments using carrageenan-induced paw edema and cotton pellet granuloma models.
- The extract did not induce abnormal changes in vital biochemical markers or organ functions in these animal studies, suggesting good safety profiles.
- Studies report the plant's extracts exert strong antioxidant effects that further contribute to tissue protection without causing oxidative damage.
- In vitro cytotoxicity assays indicate some potential anti-cancer activity at higher concentrations but do not show toxicity at anti-inflammatory therapeutic doses.
- Protease inhibition and albumin denaturation assays support the safe use of the extract as an anti-inflammatory agent.

CONCLUSION :

Flueggea leucopyrus has demonstrated notable anti-inflammatory efficacy linked to its diverse phytochemical composition. Animal studies validate its ability to reduce inflammation and oxidative damage, complementing its established traditional medicinal uses. Beyond inflammation, the plant exhibits antioxidant, antimicrobial, anticancer, and potential antidiabetic activities, highlighting its wide therapeutic promise. Toxicological evaluations confirm its safety at effective dosages, reinforcing its suitability as a natural remedy. Overall, *Flueggea leucopyrus* offers valuable opportunities for the development of plant-based herbal therapeutics with fewer side effects than synthetic drugs, supporting its future research and application in managing inflammatory and related disorders.

RESULT :

The PDF reports on the anti-inflammatory potential of the plant *Flueggea leucopyrus*. This plant contains important bioactive compounds like flavonoids, alkaloids, tannins, and saponins, which contribute to its strong anti-inflammatory and antioxidant effects. Studies have shown that extracts from *Flueggea leucopyrus* reduce inflammation in animal models by lowering pro-inflammatory markers and oxidative stress. It is traditionally used for wound healing, reducing swelling and pain, cancer treatment, digestive issues, and liver health. Toxicology studies suggest that the plant is safe at anti-inflammatory doses, with no significant adverse effects. Overall, it shows promise as a natural anti-inflammatory agent for medicinal use.

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