



OVERVIEW OF SCARLET BUSH: A RED BOUQUET

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Abstract: *Hamelia patens* (Rubiaceae) is a widely cultivated decorative plant that thrives in warm and humid regions across the globe. A significant portion of the global population continues to rely solely on plants for medicinal purposes, with plants being the primary source of active ingredients for the majority of traditional medicinal products. *Hamelia patens* Jacq. (Also known as *H. erecta* Jacq.) is a sizable evergreen shrub that is native to the Americas. It was brought to India as a decorative plant and cultivated in gardens. This perennial bush thrives both in sunny areas and in shaded environments. The utilization of this plant in traditional medicine extends to a variety of health conditions. It exhibits analgesic, antiseptic, anti-inflammatory, febrifuge, and refrigerant properties. *Hamelia patens* contain oxindole alkaloids, Flavonoids. Other chemical constituents are ephedrine, carbohydrate, proteins, tannins. This review explain about chemistry & Pharmacological investigations of *Hamelia patens* that have validated by different researchers.

Index Terms - *Hamelia patens*, Firebush, Scarlet bush, Ethanolic extraction, Antinociceptive

I. INTRODUCTION

The popularity of medicinal plants is increasing worldwide, and their utilization as natural alternatives in modern society is growing steadily on a daily basis. [1] The utilization of plants for treating various health ailments is also described in ancient literature such as Rigveda, Yajurveda, Atharvaveda, Charak Samhita, and Sushrut Samhita. [2] herbal medicine would promise a greater viable solution for effective treatment of diseases. *Hamelia patens* is referred to by various synonymous names, including *Hamelia cocinea*, *Hamelia latifolia* Reichb. ex DC, *Hamelia pedicellata* Wernh., and *Hamelia erecta* Jacq. It also goes by different common names such as Fire bush in English, *Hamelia* in Hindi, Chota *Hamelia* in Marathi, Pata de pajaro in Spanish, Ix-canan in Mayan, and Muna in Bengali. [3]

TAXONOMICAL DESCRIPTION

Kingdom: Plantae

Subkingdom: Tracheobionta

Subdivision: Spermatophyta

Division: Magnoliophyta

Class: Magnoliopsida

Subclass: Asteridae

Order: Rubiales

Family: Rubiaceae

Genus: *Hamelia* Jacq.

Species: *Hamelia patens* Jacq [4,5]

The firebush is a type of perennial shrub that thrives in both sunny and shaded areas. It typically reaches a height of approximately 6 feet. *Hamelia patens* possesses both tap and lateral root systems, characterized by

numerous delicate roots. The roots display a reddish-brown color, while the stem bark appears smooth and grey, with the inner bark being light green. Plants may have single or multiple stems. This shrub can have either a single or multiple stems, and its twigs exhibit colors ranging from orange to purple. [6] Leaves are opposite or grouped in threes or fours, and finely hairy to glabrous. The terminal inflorescence of the firebush consists of a modified dichasium, with tubular flowers measuring 12 to 22 mm in length and displaying colors ranging from orange to red. As the fruit develops, it transforms into a spherical to elliptical berry, reaching a length of 7 to 10 mm. Initially, the fruit is red, but it eventually matures and turns black. It is worth noting that the fruit of the firebush is edible. [7,8] Propagation is by soft wood cuttings in spring or by seed. [9] Plantation begins in mid-May, flower and fruiting timing is June September with well drainage soil. [10]

II. PHYTOCHEMISTRY

Hamelia has the maximum number of secondary metabolites. Aerial parts of *Hamelia patens* methanolic extract contains, flavonoids, saponins, glycoside, alkaloids, sterols, proteins, phenolic, and acidic compounds. It contains monoterpene indole constituent of tetrahydroalstonine, aricine, mitrajavine, and oxindole alkaloids contain pteropodine, isopteropodine, speciophylline, palmirine, rumberine, maruquine, (-) hameline and isomaruquine respectively. Phenolic compounds, particularly flavonoids, present in the extract include 5,7,2',5'-tetrahydroxy-flavanone, 7D-glucoopyranoside, 5,7,2',5'-tetrahydroxy-flavanone, 7-O-a-L-rhamno-pyranoside, rosmarinic acid, and narirutin. Furthermore, the ethyl acetate extract obtained from the leaves contains kaempferol 3-O-rutinoside and (-) epicatechin. Aerial part of *Hamelia* contains hetroyohembine, structure similarity with isopteropodine. Palmirine, rumberine, and maruquine revealed significant leishmanicidal activity. [11,12] Figure 1 shows some chemical constituents of *Hamelia patens*.

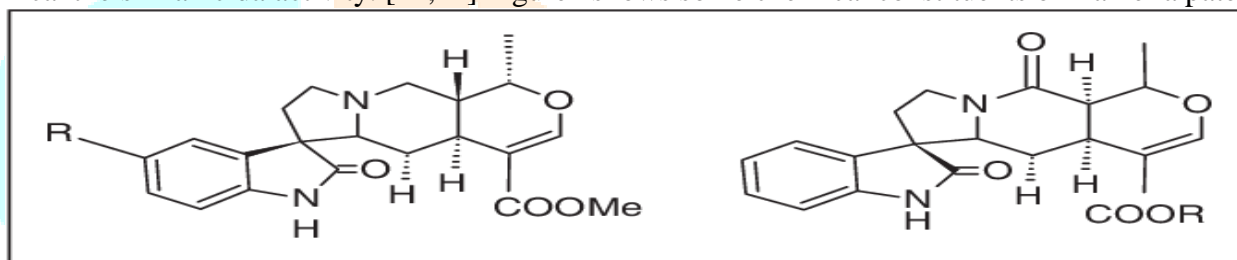


Figure 1

Isopteropodine, R = H

Rumberine, R = OH

Palmirine, R = OMe

Maruquine, R = H

Alkaloids A, R = Me

Among the main alkaloids, palmirine demonstrated the most potent leishmanicidal activity, exhibiting an IC₅₀ value of 56 μM. The alkaloid mitrajavine was also tested using the promastigote form of the parasite. Additionally, two flavonoids, namely kaempferol-3-O-rutinoside and (-) epicatechin, were isolated from the ethyl acetate extract of leaves. [13]

III. TRADITIONAL USES

The firebush is a valuable medicinal plant renowned for its therapeutic properties in treating various ailments. These include athlete's foot, wound healing, asthma, nervous shock, eczema, headache, pain relief, expulsion of intestinal worms, scurvy, inflammation, skin lesions, rheumatism, dysentery, and afflictions of the uterus and ovaries. The fresh sap from its leaves is utilized to halt bleeding from wounds, while the roots are employed in treating inflammation of the uterus. Additionally, the leaves of the scarlet bush have a cooling and refreshing effect and aid in alleviating menstrual disorders. [14]

IV. PHARMACOLOGICAL ACTIVITIES OF SCARLET BUSH

ANTIDIABETIC ACTIVITY

The potential anti-diabetic effects of firebush stems were examined in rats with alloxan-induced diabetes. The pet ether and ethanol extracts of the plant, administered at a dose of 400mg/kg, exhibited a significant hypoglycemic effect, effectively reducing the total cholesterol and triglyceride levels in comparison to the standard drug glibenclamide. [15]

Researchers reveal that extracts of *Hamelia patens* with a high content of phenolic compounds elicit α-glucosidase inhibition and an antihyperglycemic effect. At a concentration of 150 mg/kg, they produce an equivalent effect to metformin. [16]

ANTI- NOCICEPTIVE ACTIVITY

In the hot plate test, the ethanolic extract derived from *Hamelia patens* (EEHP) exhibited a moderate anti-nociceptive impact, approximately 25% at a dosage of 200mg/kg. Furthermore, in the chemical-induced nociception model, EEHP demonstrated a comparable antinociceptive effect to naproxen (100mg/kg) within the dosage range of 100–200mg/kg. Due to its impressive effectiveness and low toxicity, this plant shows promise as a valuable resource for antinociceptive agents. [17]

CYTOTOXIC ACTIVITY

To evaluate the cytotoxicity of the methanolic extract obtained from the leaves, stem bark, and root bark, the 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl tetrazolium bromide (MTT) assay was conducted on four cancer cell lines: nasopharynx carcinoma (KB), laryngeal carcinoma (Hep-2), cervix adenocarcinoma (HeLa), and cervix squamous carcinoma cells (SiHa). Additionally, a normal cell line canine kidney (MDCK) was included. The root bark extract of *Hamelia patens* demonstrated cytotoxic effects specifically on HeLa cells, with a Cytotoxic concentration 50 (CC50) of 13µg/mL and a selectivity index of 13.3, surpassing that of docetaxel. [18]

WOUND HEALING ACTIVITY

Using a crude extract of *Hamelia patens* obtained from El Salvador, a double incision wound healing bioassay was conducted. The breaking strength of the incisions was assessed on both day 7 and day 12. Results revealed that *Hamelia patens* significantly enhanced the breaking strength of wounds compared to the control group. [19]

ANTIFUNGAL AND ANTHELMINTIC ACTIVITY

The ethanolic extract of the leaf, stem, and roots of *Hamelia patens* possesses fungicidal and anthelmintic properties. The extract demonstrates effectiveness against fungi such as *A. fumigatus*, *Penicillium* sp., and *A. flavus*, as well as against the helminthic Indian earthworm *Pheritimaposthuma*, which resembles a roundworm found in the human intestine. The anthelmintic property is most prominent in the leaf extract, with an observed activity of 74 minutes at a concentration of 50mg/ml, comparable to the standard Piperazine at a concentration of 10mg/ml. The stem extract shows activity in 140 minutes, while the root extract exhibits the least activity, requiring 199 minutes. In terms of anti-fungal activity, the stem extract demonstrates the highest efficacy at a concentration of 1000mg/ml, followed by the leaf extract, and the root extract exhibits the least effectiveness. [20]

ANALGESIC AND ANTIPYRETIC ACTIVITY

The ethanolic extract of *Hamelia patens* leaves was examined to evaluate its analgesic effects using the Formalin-induced writhing response model, with doses ranging from 50 to 200 mg/kg. The results indicate that the analgesic activity of the extract is more significant compared to its antipyretic activity, particularly at lower doses. [21]

ANTIMICROBIAL ACTIVITY

A total of approximately 12 phenolic compounds were identified in *Hamelia patens* using three different extraction methods: maceration, soxhlet, and percolation. These extracts were then tested for their antimicrobial activity against both gram-positive and gram-negative bacteria. The results revealed that all three extraction methods exhibited a 75% efficacy against *Staphylococcus aureus* and *Salmonella typhi*. They demonstrated a 50% effectiveness against *S. paratyphi* and a complete inhibition (100%) against *Escherichia coli*. [22] One another study shown that *Hamelia* can be a source of natural antimicrobials [23]

HEPATOPROTECTIVE ACTIVITY

The hepatoprotective activity of *Hamelia patens* on HepG2 cells was evaluated by measuring AST activity after exposure to CCl₄-induced cell death. The results demonstrated that *Hamelia patens* possesses significant hepatoprotective activity, with the butanol extract showing the highest efficacy compared to the methanolic and ethyl acetate extracts. Additionally, the plant extract exhibited good antioxidant properties. [24]

CONTRACTION OF MYOMETRIUM

The methanol extract obtained from the leaves of *Hamelia patens* was found to induce relaxation in a concentration-dependent manner in rat myometrium when subjected to high KCl-induced contractions. [25]

ANTIOXIDANT ACTIVITY

The antioxidant activity of the hydroalcoholic extract derived from the leaves of *Hamelia patens* was evaluated using the 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical assay. The IC₅₀ value for the hydroalcoholic extract of *Hamelia patens* was determined to be 116µg/ml. [26]

V. CONCLUSION

Hamelia patens has a long-standing traditional use in treating various ailments. Various primary and secondary metabolites, such as flavonoids, alkaloids, tannins, carbohydrates, and proteins, have been isolated from different parts of the plant. *Hamelia patens* have been known for its broad range of biological activity. Pharmacological studies have confirmed the effectiveness of *Hamelia patens* in different medicinal applications. There is a global shift towards utilizing non-toxic plant products that have a history of traditional medicinal uses. It is crucial to prioritize the development of modern drugs based on the extensive knowledge gained over centuries regarding these plants. This emphasis on utilizing traditional medicinal knowledge can play a significant role in combating a wide range of diseases.

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