



A REVIEW: PLANT OVERVIEW, PHYTOCHEMICAL COMPOSITION, AND PHARMACOLOGICAL CHARACTERISTICS OF *DURANTA ERECTA* (BHARANGI)

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ABSTRACT

A majority of global populations relies on an indigenous remedy as their primary medical care, with plants being the predominant source. Numerous plant species are utilized for treating various diseases, and conditions. Among that, *Duranta erecta*, a moderate-sized shrub from the Verbenaceae family, known by names such as Pigeon Berry, Golden Dewdrop, and Creeping Skin Flower, has been identified. Various components of the plants, such as leaf, branches, fruits, and flowers have been documented for their anti-malarial, anti-bacterial, anti-oxidant, and cytotoxic properties. Analysis of these plant components reveals the existence of diverse phytochemical components including alkaloid, terpenes, flavonoids, tanins, saponin and sterols. The current analysis extensively emphasizes on morphology, phytoconstituents, and pharmacological properties of *Duranta erecta* in thorough detail.

Keywords: *Duranta erecta*, Morphology, Phytoconstituent, Pharmacological attributes, Traditional applications.

INTRODUCTION

From very ancient times, various herbs are using in treatment, prevention, and cure the numerous infections and diseases. Numerous plants are associated with a plethora of healing properties, encompassing anti-diabetic, analgesic, anti-inflammatory, anti-malarial, hypoglycaemic, anti-microbial, stimulant, immunomodulatory, anti-cancer, and anti-hypertensive effects (1). According to the 'World Health Organisation (WHO) report around 80% of the world's population depends on herbal traditional medicine' in certain parts of prime health care (2). Many different diseases and ailments are treated with various herbs. One of these is Linn's *Duranta erecta*. belongs to the Verbenaceae family and is a tiny to moderately-sized plant. It is also known by the names Angels Whisper, Brazilian Sky flower, Duranta, Golden Dew Drop, Golden Tears, and Pigeon berry. It has been observed that plant components with antimalarial, antibacterial, antioxidant, and cytotoxic properties include leaves, fruit, stems, and flowers. Its' effective therapeutic qualities are said to be derived from 'phytoconstituents such as alkaloids, flavonoids, glycosides, phenolics, saponins, steroids, tannins, and terpenoids'. The other significant ingredients that support the restorative qualities include Scutellarein, Repenoside, Pectolinarigenin, Durantol, And Repenins (3,4,5)

PLANT PROFILE

Plant name: Duranta

Scientific name: *Duranta erecta*

Other scientific name: *Duranta plumieri*

Duranta repens

Duranta spinosa mill

Family: Verbenaceae



Figure 1. Duranta

Vernacular name:

- **Hindi:** Bharangi
- **Bengali:** kata mehadi
- **English:** Angels whisper, Brazilian Sky flower, Duranta, Golden dewdrop, Golden tears, Pigeon berry.
- **Spanish:** tala Blanco

Taxonomy

- Domain: Eukaryotes
- Kingdom: Plantae.
- Phylum: Spermatophyta.
- Subphylum: Angiospermae.
- Class: Dicotyledonae.
- Order: Lamiales.
- Family: Verbenaceae.
- Genus: Duranta.
- Species: Duranta erecta (5,6)

BOTANICAL DESCRIPTION

The Duranta genus is composed of around 35 evergreen shrub species, found in tropical and subtropical settings, being part of the Verbenaceae family. (5). The species bears the name of the Italian botanist Castore Durante, who lived in the sixteenth century (7).

D. erecta is a small tree or sensitive evergreen shrub that spreads to an equal width and can grow up to 7 meters tall (5). It resembles a vine. Mature plants typically have strong axillary thorns on their stems, whereas immature plants do not have these thorns (5). The majority of leaves are oval, paired, whorled, and measure 2.5 to 7.6 centimeters in length (6). blooms: tiny yet tubular, with colors ranging from purple to white to violet to blue, the flower hangs in long racemes measuring approximately 15 cm (5). Fruits: The fruit is subglobose or oval-shaped, glossy, and measures around 7 to 10 mm in diameter. It has an orange-yellow hue (5).

PHYTOCHEMICAL CONSTITUENT

C-alkylated flavonoid

steroids

flavonoid

tannin

terpenoid

triterpene

Plasmodium,

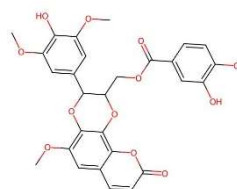


Figure 5. Repenin D

Recently identified six known compounds, including beta-sitosterol Naringenin, Sucrose, Raffinose, acetoside, Triterpene saponin, glycoside, Iridoid glycoside such as durantoside, and lamiide were isolated along with new constituents oumarinolignoid, Repenin, cleomiscosin and durantin(14,8).

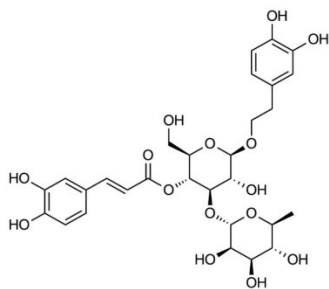


Figure 2. Acetoside

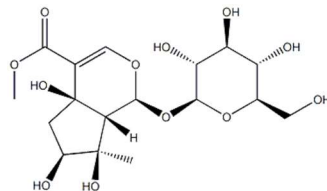


Figure 3. lamiide

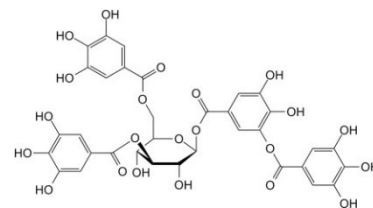


Figure 6. Tannin

TRADITIONAL USE

Indigenous plants play a crucial role as a valuable reservoir of natural remedies and continue to be widely employed for the treatment of various illnesses. *Duranta erecta*, in particular, has a traditional medicinal application for a diverse range of health issues. The infusion of its leaves and the juice extracted from its fruits exhibit diuretic properties, while the flowers are believed to possess stimulant qualities. It's noteworthy that both the leaves and fruits show a positive result for “hydrocyanic acid”, indicating a potentially poisonous, and toxic nature (16).

‘In traditional Chinese medicine, the *Duranta erecta* fruit was once considered to be a poisonous berry. However, it has been found to be effective in addressing malaria, a persistent and significant health concern in many regions. When the fruit is mashed and soaked in water, the juice obtained has lethal effects on mosquito larvae, even when diluted at a ratio of 1:100 with water. The juice is somewhat less effective on culicine larvae. Therefore, it is recommended to use it as a larvicide in ponds and swamps. The leaves of the *Duranta erecta* were also used in traditional Chinese medicine to treat abscesses.’ (15).

In Bangladesh, tribal and mainstream are used for malaria. Also used by mainstream Kavirajes as insect repellent, mosquito repellent, treatment of itches, Reproductive difficulties, elevated body temperature, and lung inflammation(16).

In Andhra Pradesh, the whole plant parts of *Duranta erecta* have records used for fever, asthma, and bronchitis (17).

In India, the stems and leaves of *Duranta* are employed for addressing cataracts (18).

In Nigeria, the fruits are employed for the treatment of malaria, parasitic infections, and abscesses. (19).

PHARMACOLOGICAL ACTIVITY

Anti--cancer Activity:

Using 3 'cancer cell lines' "MCF-7 (breast), HL-60 (leukemia), and HT-29 (colon)" *in vitro* anti-cancer action of Ethyl Acetate, Methanol, Chloroform, and water extracted *D. erecta*, assessed at different doses of using the SRB test. It was discovered that human leukemia cell line HL-60 was responsive to chloroform, ethyl acetate, and methanol extracts, while human colon and human breast cancer cell line MCF-7 was not responsive to any of these extracts (10).

Anti-oxidant and cytotoxic activity:

the effects of *Duranta erecta* fruit were examined in relation to oxidative cell death caused by H₂O₂. Ethanol and methanol extracts of *D. erecta* at varying concentrations [0-1000 µg/ml] were appraised for 24 hours on HEK293T cells, followed by a 24-hour treatment with 100 µM H₂O₂. The extracts were identified: cytotoxicity, antioxidant activity, and antioxidant components (9).

Anti-helminthic Activity:

The anthelmintic effectiveness of *Duranta erecta* (Verbenaceae) fruits was investigated by infecting "adult male albino mice" with "Heligmosomoides bakeri". The extraction was not acutely hazardous when taken orally because its LD₅₀ was >5000 mg/kg body weight. Furthermore, it was discovered that plant extract could not eradicate adult worms or the fecal egg production from the "gastrointestinal tracts" of the infected animal, not even at high dosages. It was not advised to use this medication as an anthelmintic since the study's results showed a poor anthelmintic impact (11).

Antiuro lithic activity

The methanolic extraction of *Duranta erecta* leaves was investigated for its anti-urolithiasis activity through blend of *in-vitro* and *in vivo* methodologies. In the "nucleation assay and synthetic urine assay", *Duranta erecta* obstructs the formulation of calcium oxalate and calcium oxalate monohydrate crystal. Creating a zone of inhibition against specific bacteria, it demonstrated its antibacterial properties. An *invivo* investigation using "the Wistar rat animal model" validated-methanolic extraction - *Duranta erecta* leaf for anti-urolithiasis characteristics (12).

Larvicidal Activity:

Working towards the creation of a safe, environmentally friendly solution to combat mosquito-borne diseases, the effectiveness of an aqueous extract from *Duranta erecta* leaves against *Aedes aegypti*, the vector of "dengue and yellow fever", was examined. Using the "emersion method", the water based extraction from *Duranta* leaf at various concentration was tested against 1050 *A. aegypti* fourth instar larvae and 525 eggs. Fecundity

inhibition, adult emergence, pupa, and adult emergence, and the proportion of larvicidal ovicidal activities were all measured. Fecundity exhibited a concentration-dependent rise, accompanied by the suppression of adult emergence, as well as larvicidal and ovicidal effects (12).

Anti-fungal action:

The antifungal action of “*Duranta erecta*”, is observed compared to ‘phytopathogenic fungi’ such as *Aspergillus niger*, *flavus*, *penicillium*, *fumigatus*. The leaf extract exhibited the most significant antifungal activity against *fumigatus*. The stem extraction was found to be inactive counter to *A. flavus*, and less effective against all test fungi. root extract, except for *A. fumigatus*, was inactive against all fungi (13).

Anti-bacterial activity:

The antibacterial efficacy of *Duranta erecta* shrubberies in Nigeria was evaluated through “the agar diffusion method” against a spectrum of Bacterias, including *Proteus Mirabilis*, *Bacillus subtilis*, *Bacillus aerius*, *Salmonella typhi*, at different concentration. The methanolic extract's minimal inhibitory concentrations against ‘*P. mirabilis*, *B. subtilis*, *S. typhi*, and *B. aureus*’ growth were observed. Using “the Disc Diffusion Method”, the anti-bacterial activity of *Duranta erecta* (Verbenaceae) seed was assessed against four ‘Human Pathogenic Bacteria: *B. subtilis*, *P. aeruginosa*, *S. aureus*, and *E. coli*’. “The agar cup diffusion method” was employed to assess the antibacterial efficacy of various extracts from *D. erecta* against ‘bacteria like *E. coli*, *klebsiella pneumonia*, *typhi*, *aureus*, *subtilis*, *aerogenes*, *cereus*’. Methanol extracts demonstrated noteworthy antibacterial effectiveness, surpassing the performance of standard drugs like streptomycin and gentamicin (14).

CONCLUSION

This study indicates that the stems and fruits of *Duranta erecta*, a member of the Verbenaceae family, possess the potential to be explored as efficient natural substance as repelling mosquitoes and controlling larvae. This plant has a history of use in treating different illnesses and has been documented for its antimalarial, cytotoxic, antioxidant, antifungal, and antibacterial properties. The findings of this investigation affirm that *Duranta erecta* is a noteworthy medicinal plant possessing mosquito-repellent and larvicidal properties. In recent years, traditional medicines have garnered increased attention and have been scrutinized for both their effectiveness and safety aspects concerning human use.

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