



# Plant profile, Phytochemical and Pharmacological properties of *Duranta erecta* (Golden Dew Drop): A review

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**Abstract:** More than half of the world's population depends on traditional medicine for their primary health care. The main source of traditional medicine in plants. Numbers of plants are used in the treatment of different diseases and ailments. Among them, *Duranta erecta* Linn. is a small to moderate size plant of family Verbenaceae, commonly called as Skyflower, Pigeon berry, Golden dewdrop, Creeping Skin Flower. Plant parts such as leaves, fruit, stem, and flowers have been reported for possessing antimalarial, antibacterial, antioxidant, and cytotoxic activity. Screening of fruit, flowers, leaves, and stem shows the presence of various phytochemicals like iridoid glycoside, alkaloids, flavonoids, saponins, terpenes, tannins, and sterols. The present review focuses on details of geographical distribution, morphology, phytoconstituents, and pharmacological properties of *Duranta erecta* reported so far.

जगातील निम्म्याहुन अधिक लोकसंख्या त्यांच्या प्राथमिक औषध उपचारांसाठी पारंपारिक औषधांवर अवलंबवून आहे. वनस्पती हे पारंपरिक औषधांचे मुख्य स्तोत्र आहे. खूप साऱ्या वनस्पतींचा औषध म्हणून वेगवेगळ्या रोगांवर आणि आजारासाठी वापर केला जातो. त्यांच्यापैकी दुरान्तया इरेक्टया (पिवळी मेनदी) हि एक वेरुबेन्सए कुटुंबातील लहान प्रकाराची वनस्पती आहे. या वनस्पतीला स्काय फ्लॉवर, पिजन बेरी, गोल्डन देवद्रोप, क्रीपिंग स्किन फ्लॉवर असेही म्हणतात. या वनस्पतींच्या वेगवेगळ्या भाग जसे पान, फुले, फळ, फांदी मूळ इत्यादींना वेगवेगळे औषधीय गुणधर्म आहे. त्यांचा वापर मलेरिआ, कर्करोग, मध्ये होतो. तसेच त्यांना अँटिऑक्सिडंट, बॅक्टेरीया वाढीस प्रतिबंधक म्हणून वापरले जातात. या वनस्पतींच्या पान, फुले, फळ, फांदी इत्यादींमध्ये वेगवेगळे औषधीय घटक जसे कि ग्लायकोसाईड, अल्कलॉइड्स, फ्लॉवॉनॉइड्स, टॅनिन्स, सॅपोनिन्स, स्टिरोल्स आणि टर्पेन्स आहेत. या पुनरावलोकन लेखात दुरान्तया इरेक्टया (पिवळी मेनदी) या वनस्पतींच्या भौगोलिक वितरण, आकृतिशास्त्र, औषधीय घटक आणि औषधीय गुणधर्म यांची सविस्तर माहिती नोंदवली आहे.

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**Keywords:** *Duranta erecta*, Morphology, Phytoconstituents, Pharmacology, Traditional use

## INTRODUCTION



Since ancient times plants have been used for the prevention and treatment of various diseases and ailments and are considered as the excellent natural hub of bioactive components. The number of therapeutic activities associated with medicinal plants is included antidiabetic, analgesic, anti-inflammatory, antimalarial, hypoglycemic, antimicrobial, stimulant, immunomodulator anticancer, antihypertensive [1]. The WHO estimates that about 80% of the world population relies on herbal medicine in some aspects of primary health care. *D. erecta L.* is one of the important medicinal plants, is commonly known as Golden dewdrop belongs to the family Verbenaceae. It is an evergreen shrub or small tree that can get up to 1-.3 m height. Throughout the year it bears flowers and fruits [2-4]. It mainly contains alkaloids, flavonoids, saponins, steroids, triterpenes, and tannins. In contains several iridoid glycosides as durantosides and lamiide. [5-6]. Traditionally *D. erecta* plant is used for a wide variety of ailments and disorders [7]. The plant is reported to have antibacterial, antifungal, antioxidant, antiplasmodial, and cytotoxic activities.

*Geographical Distribution:* Golden dewdrop is a popular ornamental plant that grows wild mostly in a dry coastal area from near sea level to over 100 m in elevation. It mostly found in areas with moister habitat, and especially, along roads. *D. erecta* is indigenous to Mexico, Caribbean, South America Central America, Southern Florida (possibly naturalized), Argentina, Bermuda, the Bahamas, and the West Indies. It is also native to the states of California, Arizona, Florida, Louisiana, and Texas in the USA. The plant is largely cultivated in tropical and subtropical parts which include Hawaii, American Samoa, and Guam. It is widely cultivated throughout India along the sides of rivers and banks of streams and in gardens. It grows on rocky slopes and mostly found sometimes along roadsides in villages [7]. *D. erecta* plant forms a part of the coastal scrub community and contributes to soil and ecosystem stability. It is a commonly grown plant when trimmed forms a strong, compact hedge that is almost impenetrable to cattle.

*Vernacular Names:*

English: Skyflower  
Afrikaans: Vergeet-my-nie, -boom-boom  
Brazilian: Pingo-de-ourovioleteira – dourada  
Chinese: Jialianqiao  
French: Durante dressee  
Indonesian: Sinyo nakal  
Japanese: Taiwan-rengyo  
Tongan: Mavaetangi  
Vietnamese: Thanhquan  
Africa: Geelbessi  
Italy: Duranta  
Thailand: Thanh yod  
Germany: Durante, Marshall Islands: Jab meloklok  
Marathi:  
Piwali mendi  
Hindi: Nilkanta  
Malayalam: Duranta  
Manipuri: Samban-lei Mana Aramgba  
Assamese: Duronta-kanta, Jeora-goch  
Kannada: Neelakantha



### Bengali: Kata Mehedi

*Classification:* The genus *Duranta* was described by Linnaeus (1753). This genus is named after Castor Durante (1529–1590), a French physician and botanist. The plants of Verbenaceae family are herbs, shrubs, or trees comprising about 100 genera and 2,600 species. Around 35 *Duranta* species with evergreen bushes are spread over the tropical and subtropical regions. Historically, there has been a lot of confusion about the taxonomy of the species *D. erecta*, which has variously been known as *D. erecta*, *D. plumieri* or *D. repens*. *D. erecta* is now recognized as the accepted name, with *D. plumieri* and *D. repens* listed as synonyms [8].

Domain: Eukaryota  
Kingdom: Plantae  
Subkingdom: Viridiplantae  
Phylum: Spermatophyta  
Subphylum: Angiospermae  
Division: Tracheophyta  
Class: Magnoliopsida  
Super order: Asteranae  
Order: Lamiales  
Family: Verbenaceae.  
Genus: *Duranta* L.  
Common Name: Golden Dewdrop (Golden fruit hanging to plant)

*Propagation:* *Duranta erecta* can be propagated from seeds or started with cutting semi-hard wood in summer.

*Morphology:* Golden Dewdrop is a vine-like tender evergreen shrub or small tree that can get up to 18 ft (5.5m) tall. Stem: It forms a multi-stemmed clump with branches herbaceous but woody below, erect, branched solid, green. There are several stems or drooping spiny branches, especially when carrying many fruits. Mature plant stem has axillary thorns which are absent in young stem. Bark: The bark is a light gray color, becoming rough, and fissured when old. Leaves: Leaves are light green in color, ovate in shape, 2.5-7.6 cm long and arranged on the stem in pairs opposite each other or whorls of three, usually have entire margins; however, sometimes, they are slightly toothed toward the pointed or round tips. Flowers: Flowers are tubular with five petals, light blue to violet or purple, It is complete, bisexual, bracteates, pedicellate, hypogynous, zygomorphic, pentamerous, bluish-white in color. Calyx made up of 5 sepals, gamosepalous, slightly tubular, persistent, valvate, small, teeth 5. Corolla made up of 5 petals, gamopetalous, tubular with unequal lobes, three anterior lobes are larger than corolla tube slightly curved, rotate, lilac or light-blue. Stamen 4, polyandrous, epipetalous, didynamous, posterior stamen absent, sagittate, ditheous. Flowers have a fragrance with bracts. The pedicel is 1-5mm long and pubescent. Fruits: Fruits are spherical yellow drupe about 1.3cm in diameter borne in showy hanging bunches. Throughout the year it bears flowers and fruits [4, 6, 7].



***Duranta erecta* plant**



**Branch**



**Fruits & Flowers**



**Leaves**



**Flowers with buds**



**Stems**



**Fruits**

Figure 1: *Duranta erecta* plant & its different parts



**Traditional Uses:** Traditional plants are an important source of natural medicine and remain to be broadly used to treat many diseases. *D. erecta* is used traditionally as medicine for a wide variety of ailments. Leaf infusion and fruit juice is diuretic, and flowers have stimulant properties. An infusion of the leaf and juice of the fruit is diuretic, and the flower is said to have stimulant properties. Both leaf and fruit give a positive test for hydrocyanic acid, which is poisonous in nature. In the Chinese system of medicine, fruits are reported as poisonous berries. The plant is claimed to treat malaria which still stands as a major disease in many countries. Water-macerated fruits yield a juice that even in dilutions of 1:100 parts of water are lethal to mosquito larvae; the action is less marked on culicine larvae. The juice can be used as a larvicide in ponds and swamps. In Chinese medicine, the fruits were used for the treatment of malaria, and the leaves are employed for the treatment of abscesses [7]. In Bangladesh, trial use for malaria, insect repellent, skin itching, infertility, fever, and pneumonia [9]. In Andhra Pradesh, India's whole plant decoction used for fever, asthma, and bronchitis [10]. In India, stems and leaves are used in cataract [11]. In Nigeria, fruits used in malaria, parasitism, and in abscesses [12].

**Phytochemical Review:** *D. erecta* contains various bioactive compounds. All parts of the *D. erecta* species have been exploited for phytochemical investigation, and various phytoconstituents are isolated to date. Various important phytochemicals have been reported such as steroids, flavonoids, terpenoids, triterpenes, C-alkylated flavonoids, beta-sitosterol, naringenin, triterpene saponins, steroidal glycosides, and glycosides. Several iridoid glycosides as durantosides are isolated from *Duranta* species [4].

**Leaves:** The leaves contain saponins, and fruits contain alkaloid analogous to nicotine. The two C-alkylated flavonoids, two C-tropane types of triterpenes, and flavonoids as 3,5,4'-trihydroxy-6,7-dimethoxyflavone [8]. Chloroform fraction of plant contains 24-ethyl-25-hydroxycholesta-4,22(23)-dien-3-one steroid, 5,6,7-trihydroxy-4'-methoxy-flavone, new iridoid, durantosides-IV pentaacetate isolated from the leaves of *D. repens* [1]. Three triterpenoid saponins, durantanin-I, II, and III, reported from the leaves of *D. repens* which are the plant growth inhibitors [13]. Durantoside-I pentaacetate, durantoside-I tetraacetate, durantoside-II tetraacetate, durantoside-IV pentaacetate, and durantoside-V tetraacetate were also isolated from *D. repens* plant. Other constituents reported were (+)-Hardwickic acid, (+)-3,13-Clerodadien-16,15-olide-18-oic acid, stigmasterol, betulin, stigmasterol 3-O-8-D-glucopyranoside [7].

**Seed & Oil:** Phytochemical analysis of seed and leaf oil of *D. erecta* yielded oxalate (0.28 and 0.38), anthocyanin (1.23% and 0.78%), rutin (8.44 and 19.38), tannin (6.58 and 5.75), unamarine (9.75 and 9.37), phenol (2.11 and 2.11), saponin (18.95 and 14.21), epicatechin (1.11 and 0.79), ribalinidine (1.87 and 0.96), apogenin (5.94 and 3.50), kaempferol (14.016 and 26.17), phytate (0.12 and 0.08), and catechin (29.32 and 16.50). Study for fatty acid reported capric, lauric, myristic, myristoleic, palmitic, palmitoleic, stearic, oleic, and linoleic acids [14].

**Pharmacological Review:** **Anticancer Activity:** *In vitro* anticancer activity of chloroform, ethyl acetate, methanol and water extracts of *D. erecta* was evaluated on three cancer cell lines, i.e. MCF-7 (Breast), HL-60 (Leukemia), and HT-29 (Colon) at various concentrations by SRB assay. It was found that chloroform, ethyl acetate, and methanol extracts were active on



Human Leukemia Cell Line HL-60 and inactive on Human Breast cancer cell line MCF-7 and Human Colon [6].

**Anthelmintic Activity:** Anthelmintic potential of *Duranta erecta* L. (Verbenaceae) fruits were evaluated using adult male albino mice infected with *Heligmosomoides bakeri*. The extract showed LD50 more than 5000 mg/kg Body weight and therefore was not acutely toxic for oral use. It was also found that at even high doses plant extract was unable to eliminate the fecal egg output or adult worms in the gastrointestinal tract of infected animals. A poor anthelmintic effect was obtained in the study so it was therefore not recommended as an anthelmintic drug [11].

**Antibacterial activity:** Antibacterial activity of the methanol extract of *D. erecta* leaves from Nigeria was evaluated against some bacteria like *P. mirabilis*, *B. subtilis*, *S. typhi*, and *B. aereus* at different concentration (75-600 mg/mL) by agar diffusion method. The minimum inhibition concentrations of methanolic extract showed against the growth of *P. mirabilis* (129 mg/mL), *B. subtilis* (141 mg/mL), *S. typhi* (81 mg/mL), and *B. aereus* (100 mg/mL) [15]. Antibacterial activity of seeds of *Duranta erecta* L. (Verbenaceae) was evaluated by Disc Diffusion Method against the Human pathogenic bacteria: viz., *Bacillus subtilis*, *Pseudomonas aeruginosa*, *Staphylococcus aureus* and *Escherichia coli* [16]. Antibacterial activity of different extracts of *D. repens* L. was evaluated against some bacteria such as *Escherichia coli*, *Klebsiella pneumonia*, *B. subtilis*, *Bacillus cereus*, *S. typhi*, *E. aerogenes*, and *S. aureus* by agar cup diffusion method. Methanol extracts demonstrated significant antibacterial activity compared to standard drugs streptomycin and gentamicin [17].

**Antifungal Activity:** Antifungal activity of *Duranta erecta* was evaluated against some phytopathogenic fungi, *Aspergillus niger*, *A. flavus*, *A. fumigatus* and *Penicillium sp.* It was found that the extract of leaf showed antifungal activity against all *Aspergillus spp.* but activity was highest against *A. fumigatus* (20±0.67 mm). Stem extract found less active against all test fungi and inactive against *A. flavus*. Root extract was found to be inactive against all fungi except less active against *A. fumigates* [18].

**Cytotoxic and antioxidant activity:** Effects of *Duranta repens* fruits were evaluated on H<sub>2</sub>O<sub>2</sub> induced oxidative cell death. Different concentrations [0-1000 µg/ ml] of ethanol and methanol extract of *D. repens* were tested against HEK293T cells for 24h, and then treated with 100 µM H<sub>2</sub>O<sub>2</sub> for 24h. Cytotoxicity, antioxidant activity and antioxidant constituents of the extracts were determined [19].

**Antiplasmodial activity:** Antiplasmodial activity of *D. repens* from Pakistan against the chloroquine-sensitive and chloroquine-resistant strains of *plasmodium faciparum*, the extract showed significant activity with IC<sub>50</sub> value 8.5±0.9 and 8.5±0.9 µg/ml [20]. Mohamed MA et al. have isolated new triterpene i.e. durantanin IV (1) and V (2) from leaves of *Duranta repens* and evaluated for their cytotoxic activity against cell line and on brine shrimps. The methanol extract and isolated compounds durantanin IV (1) V (2) and E/Z acetoside (7) demonstrated significant cytotoxic activity against a HepG2 cell line and on brine shrimp [21]. Two triterpenes i.e. β-Amyrin and 12-Oleanene were isolated from the chloroform-soluble fraction of an ethanolic extract of stem of *D. repens* and evaluated for antibacterial and antifungal activities using the disc diffusion method and cytotoxicity by brine shrimp lethality bioassay. The extract, fractions and isolated compounds showed Minimum inhibitory concentration in the range of 32-128 µg/ml [22].



**Anti-urolithic activity:** Anti-urolithiasis activity of methanolic extract of leaves of *Duranta erecta* was evaluated by *in vitro* and *in vivo* methods. *D. erecta* inhibits formation of calcium oxalate and calcium oxalate monohydrate crystals in nucleation assay and synthetic urine assay. It proved antimicrobial property by the formation of a zone of inhibition against few bacteria. An *in vivo* study on the Wistar rat animal model confirmed the anti-urolithiasis property of methanolic extract of leaves of *D. erecta* L. [23].

**Larvicidal Activity:** Efficacy of an aqueous extract of leaves of *Duranta erecta* was evaluated against yellow fever and dengue vector, *Aedes aegypti* as an approach towards developing a safe and eco-friendly agent to combat the mosquito-borne diseases. *D. erecta* leaves aqueous extract at various concentrations were tested against 525 eggs and 1050 fourth instar larvae of *A. aegypti* using the emersion method. The percentage of larvicidal, ovicidal activities, pupal and adult emergence, adult emergence, and fecundity inhibition were determined. A concentration-dependent increase in larvicidal, ovicidal, inhibition of adult emergence, and fecundity were found [24].

## CONCLUSION

This study concluded that *Duranta erecta* L. is one of the important medicinal plants and has been used in the treatment of various diseases and reported to have antimalarial, cytotoxic, antioxidant, antifungal, and antibacterial activities. In recent year's traditional medicines received more attention and evaluated for their efficacy and generally, they are safe for human beings. Numerous phytochemical and pharmacological studies have been conducted on different parts of the *Duranta erecta* L.

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## CONFLICT OF INTERESTS

We declare that we have no conflict of interest.

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