

# An Updated Review on Phytochemical Properties of “Golden Dewdrop” *Duranta erecta*

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## ABSTRACT

*Duranta erecta* (family: *Verbenaceae*) commonly referred to golden dewdrop, pigeon berry, angel whisper, or skyflower is one of the traditional medicinal plants. It has been shown to possess antimicrobial, antioxidant, and insecticide properties. Its phytoconstituents such as alkaloids, flavonoids, glycosides, phenolics, saponins, steroids, tannins, and terpenoids are reported as the basis of its efficacious therapeutic properties. The other important constituents which contribute to the remedial properties are durantol, pectolinarigenin, repennoside, repenins, and scutellarein. Published information on the phytochemical property of *D. erecta* was gathered by the use of different database platforms, including Google Scholar, ScienceDirect, PubMed, SciFinder, and Scopus, that provided an up-to-date review on its importance.

**Key words:** *Duranta erecta*, golden dewdrop, phytochemical substance, plant, traditional medicine

## INTRODUCTION

The interesting in using natural sources or green medicine or medicinal plants is increasing worldwide due to their safety, efficacy, cultural acceptability, and lesser side effects as compared to synthetic drugs such as in Africa,<sup>[1]</sup> China,<sup>[2]</sup> Ethiopia,<sup>[3]</sup> India,<sup>[4]</sup> Indonesia,<sup>[5]</sup> and Thailand.<sup>[6]</sup> The present review is to provide an up-to-date information of the phytochemical properties of *Duranta erecta*, one of the plants, that is being investigated for diverse health benefits.

## Plant Description

*d. erecta* is an upright scrambling shrub with a height 1–3 m. Stem [Figure 1a]: There are several stems or drooping spiny branches, especially when carrying large number of fruit. The bark is light gray, becoming rough, and fissured when old. There are usually at least some pairs of spines along the stems, one located at the base of each of the leaf stalks. Flowers [Figure 1b]: Light-blue, lavender, or purple, tubular with 1 cm long, five-lobed flowers are borne on the terminal or axillary racemes in sprays up to 20 cm long. Leaves [Figure 1c]: Light-green, opposite leaves are elliptic to ovate. The leaf blades, 15–90 mm long and 12–60 mm wide, usually have entire margins; however, sometimes, they are slightly toothed toward the pointed or round tips. Fruits [Figure 1d and e]: The yellow or yellow-orange fleshy mature fruits are spherical 5–10 mm across with five lobes and grow in hanging clusters.<sup>[7]</sup>

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## Taxonomical Classification

The taxonomy of *D. erecta* is in the kingdom (*Plantae*), subkingdom (*Viridiplantae*), infrakingdom (*Streptophyta*), superdivision (*Embryophyta*), division (*Tracheophyta*), subdivision (*Spermatophytina*), class (*Magnoliopsida*), superorder (*Asteranae*), order (*Lamiales*), family (*Verbenaceae*), genus (*Duranta*), and species (*D. erecta*).<sup>[8]</sup> This genus is named after Castor Durante (1529–1590), a French physician and botanist.<sup>[9]</sup> The species “erecta” means “upright” in Latin. The genus *Duranta* comprises from 17 to 34 species.<sup>[10]</sup>

## Nomenclature

*D. erecta* is a native plant of Southern America, Mexico, Central America, Caribbean, and other areas that spread throughout the tropical and warm subtropical regions.<sup>[11]</sup> The vernacular names of *D. erecta* include golden dewdrop, pigeon berry, angels whisper, and skyflower (English); vergeet-my-nie-boom (Afrikaans); pingo-de-ouro and violeteira-dourada (Brazilian); kata mehedi (Bengali); jia lian qiao (Chinese); durante dressee and vanillier de cayenne (French); sinyo nakal (Indonesian); sinyo nakal (Japanese); cuentas de oro and san jacinto (Spanish); dueanta (Tagalog); thanh yod (Thai); and thanh quan (Vietnamese).<sup>[12]</sup>

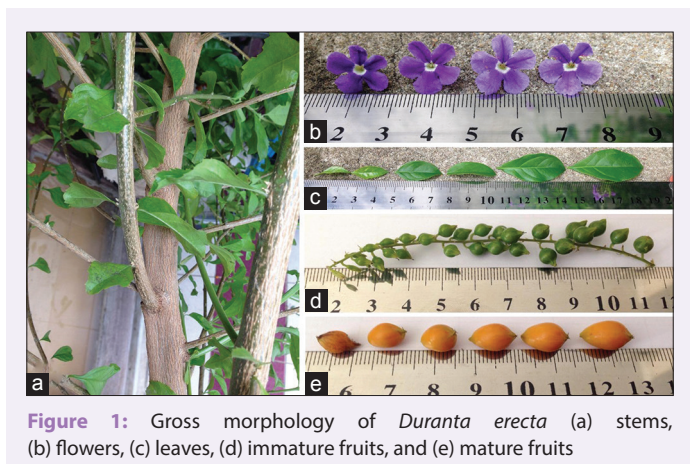
## Phytochemical Substances

Its active phytochemical substances are alkaloid,<sup>[13]</sup> flavonoid glycosides,<sup>[14]</sup> saponins,<sup>[15]</sup> steroids,<sup>[16]</sup> tannins, and triterpenes.<sup>[17]</sup> The other active constituents are durantol,<sup>[18]</sup> scutellarein, pectolinarigenin,<sup>[19]</sup> iridoid glycosides such as repennoside,<sup>[20,21]</sup> and coumarinolignoids such

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**Figure 1:** Gross morphology of *Duranta erecta* (a) stems, (b) flowers, (c) leaves, (d) immature fruits, and (e) mature fruits

as cleomiscosin and repenins.<sup>[22]</sup> Abou-Setta *et al.*<sup>[23]</sup> reported that six new compounds as  $\beta$ -sitoserol, naringenin, acteoside, lamiide, sucrose ( $\alpha$ -glucopyranosyl- $\beta$ -fructopyranoside), and raffinose were isolated from *Duranta repens*. The quantity of phytochemical screening of 100 g of *D. erecta* leaves showed the presence of tannins (0.49 mg), flavonoids (0.85 mg), alkaloids (0.14 mg), and saponins (0.78 mg) in the methanolic extract.<sup>[24]</sup> A review of literature regarding the traditional uses or phytochemical properties of *D. erecta* is shown here.

### Antioxidant Activity

Shahat *et al.*<sup>[25]</sup> isolated three compounds from methanol extract of *D. repens* from Egypt, i.e. phenylethanoid glycoside acteoside, iridoid lamiide, and saponin pseudo-ginsenoside-RT1. Acteoside showed an  $IC_{50}$  of  $3.05 \pm 0.09$   $\mu$ g/mL in the DPPH assay while lamiide and pseudo-ginsenoside-RT1 were not active. Moreover, Khan *et al.*<sup>[26]</sup> reported that the ethanol and methanol extracts of *D. repens* fruits from Bangladesh possess antioxidative potential, which can protect  $H_2O_2$ -induced oxidative cell damage. HEK293T cells were treated with different concentrations 0–1000  $\mu$ g/mL of ethanol and methanol extracts for 24 h and then treated with 100  $\mu$ M  $H_2O_2$  for 24 h. Cell viability, antioxidant parameters of cells, and antioxidant constituent of the extracts were determined. The results showed that ethanol and methanol extracts increased the survival rate of  $H_2O_2$ -treated HEK293T cells, lipid peroxidation, 2,2-diphenyl-1-picrylhydrazyl, and  $H_2O_2$ -scavenging activities.

### Antibacterial Activity

Nikkon *et al.*<sup>[27]</sup> reported that the minimum inhibitory concentrations of *D. repens* stem and fruit from Bangladesh against *Shigella boydii*, *Shigella shiga*, *Shigella dysenteriae*, *Shigella flexneri*, and *Shigella sonnei* were found to be in the range of 32–128  $\mu$ g/mL. Ogbuagu *et al.*<sup>[24]</sup> reported the antibacterial activity of the methanol extract of *D. erecta* leaves from Nigeria against some human pathogenic bacteria; *Proteus mirabilis*, *P. mirabilis*, *Bacillus subtilis*, *Salmonella typhi*, and *Boletus aereus* at 75, 150, 300, and 600 mg/mL by agar diffusion method. The result of minimum inhibition concentrations showed activities 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).

### Antifungal Activity

sharma *et al.*<sup>[28]</sup> reported the antifungal properties of methanolic extract of different parts such as leaves, stem, and roots of *D. erecta* from India against *Aspergillus flavus*, *Aspergillus fumigatus*, *Aspergillus niger*, *Alternaria* sp., *Fusarium oxysporum*, *Penicillium* sp., *Rhizopus* sp., and

*Trichoderma* sp. using agar disc diffusion method. They reported that methanolic extract of leaf and stem of *D. erecta* was effective against *A. niger*, *A. flavus* and *A. fumigatus* at 1000 mg/mL concentration which recorded significant inhibition zone of 2.3 cm, 2.3 cm, and 2.2 cm, respectively. Further, Sikarwar *et al.*<sup>[29]</sup> reported the aqueous and methanolic leaf extracts of *D. repens* from India against three fungi *A. niger*, *Candida albicans*, and *Microsporium gypseum* by disc diffusion method. The result showed that methanolic extract was found to possess a more potent inhibitory effect when compared to the aqueous one. They also reported the presence of phytochemicals such as alkaloids, flavonoids, steroids, triterpenoids, tannins, and phenols which could be responsible for the antifungal activity.

### Antiviral Activity

Antiviral activity against hepatitis A virus was reported by Abou-Setta *et al.*<sup>[23]</sup> The ethanol extract of *D. repens* from Egypt showed 76% reduction viral titer of Hepatitis A at concentration of 40  $\mu$ g/mL, while at 20  $\mu$ g/mL, the inhibition reached 64% by plaque reduction assay. The methanolic extract showed 88% inhibition at concentration of 40  $\mu$ g/mL, while at 20  $\mu$ g/mL, the inhibition reached 59% of the virus by the same assay. They suggested that this antiviral activity may be attributed to the acteoside or lamiide content in the extract.

### Antiparasitic Activity

Ijaz *et al.*<sup>[14]</sup> reported that *D. repens* from Pakistan showed antiparasitodal activity against the chloroquine-sensitive and chloroquine-resistant strains of *Plasmodium falciparum*, with  $IC_{50}$  values of  $8.5 \pm 0.9$  and  $10.2 \pm 1.5$   $\mu$ g/mL, respectively.

### Insecticide Property

The extracts from *D. repens* had antifeedant and insecticide properties against the larvae of *Culex pipiens* and *Spodoptera littoralis* and the adults of *Musca domestica*.<sup>[30]</sup> Nikkon *et al.*<sup>[31]</sup> suggested that the stem and fruits of *D. repens* from Bangladesh are very effective natural larvicide and can be useful against *Culex quinquefasciatus*. The highest larval mortality was found in chloroform soluble fraction of the stem, with 12 h- $LC_{50}$  being 10.75 ppm and in ethanolic extract of fruits with 12 h- $LC_{50}$  being 8.51 ppm against the first instar larvae. Hemavathy and Anitha<sup>[32]</sup> reported that aqueous and methanolic extracts of *D. repens* leaves from India against the third instar larvae of *C. quinquefasciatus* showed high percentage of mortality than ethanolic extract. At 10% concentration of the extract of water, methanol, and ethanol, the larvae found to be dead were 17, 16, and 13 out of 20 larvae. Roy *et al.*<sup>[33]</sup> evaluated an aqueous extract of *D. repens* from India against the tea red spider mite, *Oligonychus coffeae*, to determine its effect on adult mortality, viability of eggs, oviposition deterrence, and repellent properties. The direct spray method was used at concentrations of 2, 4, 6, 8, and 10 g/L. Deposition of eggs by adult mites on treated leaf surfaces decreased and the viability of eggs was also reduced. Its efficacy was comparable to that of the commonly used commercial neem oil azadirachtin formulation. In addition, in the field, the application of the aqueous extract of *D. repens* reduced the mite population and its efficacy was comparable to that of the synthetic pesticide propargite.

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## Conflicts of interest

There are no conflicts of interest.

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