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Exploring the Botanical Wonders of Tarenna Asiatica (L.) Kuntze Ex K. Schum

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KEYWORDS
Tarenna asiatica (L.) Kuntze ex K. Schum, Phytoconstituents, Extract, Pharmacological activity

ABSTRACT:
Tarenna asiatica (L.) Kuntze ex K. Schum, a widely distributed plant species belonging to the Rubiaceae family, has been traditionally utilized in various herbal preparations across different cultures for its purported medicinal properties. This comprehensive review aims to consolidate and evaluate the existing knowledge regarding the botanical characteristics, phytochemical constituents, and pharmacological attributes of Tarenna asiatica. Botanically, Tarenna asiatica is described in terms of its taxonomic classification, morphological features, geographic distribution, and ecological preferences. Understanding the plant's botanical aspects is essential for its proper identification and sustainable utilization. The phytochemical profile of Tarenna asiatica is explored, with a focus on its secondary metabolites such as alkaloids, flavonoids, terpenoids, and phenolic compounds. These bioactive constituents have been extensively studied and are known to impart various biological activities to the plant. Furthermore, this review comprehensively summarizes the pharmacological properties of Tarenna asiatica as reported in the literature. These encompass a wide range of activities, including antioxidant, anti-inflammatory, antimicrobial, anticancer, analgesic, and anti-diabetic effects, among others. The mechanisms of action underlying these pharmacological activities are discussed in detail, shedding light on the potential therapeutic applications of Tarenna asiatica.

INTRODUCTION

Recent years have witnessed a renewed interest in plants as pharmaceuticals in the Western world. This interest is channeled into the discovery of new biologically-active molecules by the pharmaceutical industry and into the adoption of crude extracts of plants for self-medication by the general public (1). The Rubiaceae family has a cosmopolitan distribution, mostly concentrated in the tropics. Being one of the largest in the Magnoliopsida class, it ranks fourth in diversity of species among Angiosperms. It includes approximately 637 genera and 13,000 species (2). Tarenna asiatica is the plant species under the family of Rubiaceae. The parts of Tarenna asiatica (Rubiaceae) plants are traditionally used to promote suppuration as anthelmintic and antiulcer agent. The phytochemical constituents of it are reported to be antimicrobial, anti-inflammatory, wound healing and antioxidant. Besides, the extract of shoots, leaves and fruits are purportedly active against Mycobacter phlei (3).

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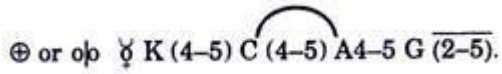
TAXONOMICAL CLASSIFICATION
Kingdom: Plantae
Phylum: Angiosperms
Class: Eudicots
Order: Gentianales
Family: Rubiaceae
Genus: Tarenna **Species:** *Tarenna asiatica*

PLANT PROFILE
THE FAMILY: *RUBIACEAE*
The Rubiaceae are a family of flowering plants, commonly known as the coffee, madder, or bedstraw family. It consists of terrestrial trees, shrubs, lianas, or herbs that are recognizable by simple, opposite leaves with interpetiolar stipules and sympetalous actinomorphic flowers. The family contains about 13,500 species in about 620 genera, which makes it the fourth-largest angiosperm family. Rubiaceae has a cosmopolitan distribution; however, the largest species diversity is concentrated in the tropics and subtropics.
CHARACTERS OF RUBIACEAE
The Rubiaceae are distinctive in being trees, shrubs, lianas, or herbs with simple, entire, usually opposite or decussate leaves and connate stipules, the stipules often with mucilage-secreting colleters, the inflorescence usually a cyme, flowers usually bisexual, the perianth dichlamydeous, perianth and androecium often 4 –5-merous (calyx absent in some), the ovary usually inferior (rarely superior), often with an apical nectariferous disk, ovules with a funicular obturator, the fruit a berry, capsule, drupe, or schizocarp.

VEGETATIVE CHARACTERS
HABIT: the Rubiaceae consists of terrestrial and predominantly woody plants. Woody rubiaceous shrubs constitute an important part of the understorey of low- and mid-altitude rainforests. Rubiaceae are tolerant of a broad array of environmental conditions (soil types, altitudes, community structures, etc.) and do not specialize in one specific habitat type.
ROOT: Tarenna asiatica has a fibrous root system, which means it consists of many fine, branching roots rather than a single large taproot.
STEM: Bark is greyish brown, scaly; blaze with orange speckles.
LEAF: Elliptic to elliptic-ovate, leaves are 8-18 cm long, 4-8 cm wide, with short elongation at the tip. Leaf stalk is up to 0.5-2 cm. Leaf margin is entire and somewhat curled.

FLORAL CHARACTERS
INFLORESCENCE: The inflorescence is a cyme, rarely of solitary flowers (e.g., Rothmannia), and is either terminal or axillary and paired at the nodes.
FLOWER: The 4-5-merous (rarely pleiomerous; e.g., six in Richardia) flowers are usually bisexual and usually epigynous. The perianth is usually biseriate, although the calyx is absent in some taxa (e.g., Theligonum).
CALYX: The calyx mostly has the lobes fused at the base; unequal calyx lobes are not uncommon, and sometimes (e.g., Mussaenda) one lobe is enlarged and coloured (a so-called "semaphyl").
COROLLA: The corolla is sympetalous, mostly actinomorphic, usually tubular, mostly white or creamy but also yellow (e.g., Gardenia spp., Mycelia basiflora), and rarely blue (e.g., Faramea calyptrata) or red (e.g. Alberta magna, Ixora coccinea).
STAMEN: Stamens are alternipetalous and epipetalous.
ANDROCIUM: Anthers are longitudinal in dehiscence, but are poricidal in some genera (e.g. Rustia, Tresanthera).
GYNOECIUM: The gynoecium is syncarpous with an inferior ovary (rarely secondarily superior, e.g., Gaertnera, Pagamea).
OVULES: Ovules are anatropous to hemitropous, unitegmic, with a funicular obturator, one to many per carpel.
FRUIT: The fruit is a berry, capsule (e.g., Oldenlandia), drupe (e.g., Coffea, Psychotria), or schizocarp (e.g., Cremocarpon). Red fruits are fairly dominant (e.g., Coffea arabica); yellow (e.g., Rosenbergiodendron formosum), orange (e.g., Vangueria infausta), or blackish fruits (e.g., Pavetta gardeniifolia) are equally common; blue fruits are rather exceptional save in the Psychotrieae and associated tribes. Most fruits are about 1 cm in diameter; very small fruits are relatively rare and occur in herbaceous tribes; very large fruits are rare and confined to the Gardenieae.
SEED: The seeds are endospermous.
POLLINATIOIN: Hermaphroditic, self-and cross-compatible, protandrous, nectariferous and entomophilous.

FLORAL FORMULA:



DISTRIBUTION OF RUBIACEAE:
The family Rubiaceae is cosmopolitan in distribution with approximately 13,200 species in 615 genera. The species are concentrated in warmer and tropical climates around the world.

COMMON PLANT OF THE FAMILY
- *Catunaregam spinosa Tirveng.*
- *Ceriscoides turgida Tirveng.*
- *Gardenia resinifera Roth*
- *Haldina cordifolia (Roxb) Ridsdale ¬ Hamelia patens Jacq.*
- *Ixora chinensis Lam.*
- *Ixora coccinea L.*

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- *Ixora parviflora Lam.*
- *Mitragyna parvifolia (Roxb.) Korth.*
- *Morinda citrifolia L.*
- *Mussaenda luteola Delile*

THE GENUS: *Tarenna*

Tarenna is a genus of flowering plants in the family Rubiaceae. There are about 192 species distributed across the tropical world, from Africa, Asia, Australia to the Pacific Islands. They are shrubs or trees with oppositely arranged leaves and terminal arrays of whitish, greenish, or yellowish flowers.

OCCURRENCE AND DISTRIBUTION

The genus contains 180 species, and is distributed in the tropical parts of Asia and Africa with species occurring in primary evergreen forests and scrub in the lowlands as well as at higher altitude.

- *Tarenna agumbensis Sundararagh.*
- *Tarenna drummondii Bridson* *Tarenna hoaensis Pit.*
- *Tarenna luhomeroensis Bridson*
- *Tarenna monosperma*
- *Tarenna nilagirica*
- *Tarenna quadrangularis*
- *Tarenna sechellensis*
- *Tarenna asiatica* (L.) Kuntze ex K. Schum

THE SPECIES: TARENNA ASIATICA

SYNONYMS: Rondeletia asiatica, Webera corymbosa, Chomelia asiatica

FEATURES: Asiatic Tarenna is a compact bush to a small tree, up to 6 m tall. Bark is greyish brown, scaly; blaze with orange speckles. Elliptic to elliptic-ovate, leaves are 8-18 cm long, 4-8 cm wide, with short elongation at the tip. Leaf stalk is up to 0.5-2 cm. Leaf margin is entire and somewhat curled. Flowers are borne in corymb-like cymes, at the end of branches. They are cream to yellow, nearly stalkless, with 5 oblong petals. Stamens are 5, with large anthers. Fruit is a 2celled berry, with many seeds. Asiatic Tarenna is found in Western Ghats.

USAGE

Tarenna asiatica (L), widely used medicinal plants in the treatment of eye infections, skin problems and abdominal pain as a traditional medicine within india and the across the globe. Tarenna asiatica has been used to treat a number of disorders, including boils, external ulcers and wounds (4).

Fig.No.1.1: *Tarenna asiatica* (L.) Kuntze ex K. Schum

PHYTOCHEMISTRY AND PHARMACOLOGICAL REVIEW ON TARENNA ASIATICA

- **Chandhirasekar K et al., 2021.** In this study, extracts of citrus fruits, Tagetes lemmonii, and Tarenna asiatica were used as reducing and blocking agents to biosynthesize AgNPs (silver nanoparticles). Ultraviolet-visible (UV-Vis), Fourier transform infrared spectroscopy (FTIR) and AgNP quantities. On the other hand, scanning electron microscopy (SEM) showed that the structures of AgNPs promoted by T. asiatica were cubic, whereas those of AgNPs promoted by T. lemmonii and C. medica were spherical. Additionally, the larvicidal activity of these samples was evaluated. Analysis of the LC50 values revealed the insecticidal potential of the three plant-derived AgNPs against Aedes aegypti in the following order: T. lemmonii-Ag NPs > C. medica-Ag NPs > T. asiatica-Ag NPs. Therefore, all three plants can produce small nanoparticles that can affect Egyptian mosquito (Aedes aegypti) by reducing Ag content and limiting the amount of AgNPs (5).

- **Suresh G et al., 2020.** In this study, a different endophytic fungus was obtained from a particular medicinal plant, Tarenna asiatica, and was selected for Taxol production. Among
28 screened fungi, only six fungal species produced Taxol in the modified liquid medium. The novel Taxol-producing endophytic fungi were identified through morphological and molecular identification using DNA sequencing and phylogenetic tree construction as Aspergillus oryzae. The structure of Taxol obtained from A. oryzae was identified with the appropriate control using an ultraviolet–visible (UV–Vis) spectrophotometer (235 nm), thin layer chromatography (TLC), liquid chromatography-mass spectrometry (LC-MS), and Fourier-transform infrared (FTIR) analysis. Mushroom Taxol (95.04 µg/L) from A. oryzae is potent.

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In vitro activity against selected cell lines (human lung cancer cell line - NCI-H460) (6).

➢ **Manojj D et al., 2020.** In this study aims to evaluate the anti-cancer activity of the plant extracts against lung cancer cell line (A549) and measure the Anti-Brucella activity of the plant extracts. The plant solvent was extracted for its active chemical components with three different polar solvents using Soxhlet apparatus. The quantitative estimation revealed that the ethanol extract of the plant possessed higher phenolics and flavonoids. In vitro studies have shown that the ethanol extract retains greater activity than water and petroleum ether extracts. The cancer cell death percentage at 100 mg/ml concentrations of the ethanol and aqueous extracts of T. The proportion of asiatica in lung cancer cell lines was 60% to 67%, respectively (7).

➢ **Pratheeba T et al., 2019.** In this study was to investigate the anti-dengue fever potential of crude leaf extracts of two plants. Pavetta tomentosa and Tarena Asiatica. In the larvicidal analysis, the acetone extracts of the two plants showed the maximum value. The effect with the lowest LC50 and LC90 values (P. tomentosa (5.968 and 7.493 µg/ml) and T. asiatica (1.288 and 1.992 µg/ml)) µg/ml)) and the same extracts of both plants showed better insecticidal activity. Adult murder activity of both Plants (0–60 min interval) performed better in acetone extract, with LC50 and LC90 values It is written as P. tomentosa (32.105 and 41.001 µg/ml) and T. asiatica (09.012 and 11.854 µg/ml). Of the two Acetone leaf extract of P. tomentosa plant has excellent antiviral properties against dengue virus cell lines. furthermore, Phytochemical properties of the plants revealed the presence of saponins, flavonoids and alkaloids in all plants studied. Extracts from both plants. GC-MS analysis results showed hexanedioic acid, bis(2-ethylhexyl) ester (22.54) and 2,6,10,14,18,22-tetracosahexane and 2,6,10,15,19,15,19,23-hexamethyl-(ALL-E) -(25.33) are the two main substances. Confirmed. Phytoconstituents of Pavetta tomentosa and tetracontane (23,580) - the main compound isolated from T. asiatica. Acetone extract. Functional groups in chemical compounds (aromatics, alkanes, alkyls and carboxylic acids) P. tomentosa and T. asiatica was analyzed using FT-IR spectra (8).

➢ **Rama Bharathi et al., 2014.** In this study Leaf bud exudates collected from local forests were extracted by maceration with benzene. In addition to the isolation of the known flavonoid coripsin, preliminary biological tests were carried out on the selection of secondary metabolites. The effects of benzene extract and agaricosin on the differentiation of Bacillus globus, Escherichia coli, Klebsiella pneumoniae, and Staphylococcus aureus were tested using the plate-plate method using streptomycin as the standard drug. The extract showed weak to moderate activity against all species tested, while corymbosin was inactive. The antioxidant activity of benzene extract was examined by nitric oxide scavenging activity, DPPH radical reduction, iron-induced lipid peroxidation, and peroxide scavenging activity using ascorbic acid as a model drug. Tests showed that the IC50 of the extract was in the range of 20-60 µg/ml (9).

➢ **Deborah, S et al., 2017.** In this study, ethanol extracts of edible fruits of the plant were tested for their anticancer activity. The extract was prepared by Soxhlet separation and vacuum evaporation method. In vitro anticancer studies were performed on human breast cancer cell lines, and cell growth inhibition assays used Eagle's minimum essential medium containing 10% fetal bovine serum (FBS). As a result, the ethanol extract of Tarenna asiatica (L.), a wild edible fruit, showed high anticancer activity and the IC50 value reached 237.08µg/ml. The plants studied have remarkable anticancer activity, so isolating the compounds that promote this activity could lead to the development of new natural herbs to treat this disease (10).

➢ **Anjanadevi N et al., 2014.** In this study, aqueous and ethanol extracts of Tarenna asiatica leaves, belonging to the Rubiaceae family, were used against five bacterial organisms (10).

➢ **Vishnu R et al., 2013.** In this study, which aimed to figure out the preliminary phytochemical screening, quantify total phenolics and flavonoids, and assess the antioxidant properties of this species. This specie's methanolic leaf extract was tested for its antioxidant capacity using the DPPH (2-Diphenyl-Picryl Hyrazylradical), ferrous ion chelating, reducing power, and ABTS radical scavenging assay. The extract's total phenolic and flavonoid content was found to be 16.95 g of GAE (Gallic Acid Equivalent) and 3.72 g of QE (Quercetin Equivalent) per 100 mg, respectively. According to the results of the current study, this species methanolic leaf extract demonstrated strong in vitro antioxidant activities, suggesting that it may have nutritional and therapeutic benefits (11).

➢ **Venkatappa, M.M et al., 2022.** This study utilizes Tarenna asiatica fruit extract to describe the function of hydrated magnesium oxide (MgO) nanoparticles. MgO nanoparticles from Tarenna asiatica fruit pulp were examined using X-ray powder diffraction, energy dispersive X-ray diffraction, UV-visible spectroscopy, FTIR (Fourier transform infrared spectroscopy), TEM (transmission electron microscopy), and SEM (scanning electron microscopy). TAFE MgO NPs (Tarenna asiatica fruit extract magnesium oxide nano particles) have an extremely substantial IC50 value of 55.95 g/L for scavenging DPPH radicals in comparison to the

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norm. Red blood cells (RBCs) were subjected to sodium nitrite (NaNO2)-induced oxidative stress in order to assess the antioxidant capacity of TAFE MgO NPs. It's interesting to note that TAFE MgO NPs can combat harmful stress variables like protein carbonyl content (PCC), lipid peroxidation (LPO), total thiols (TT), superoxide dismutase (SOD), and catalase, facilitating in the recovery of red blood cells that have been harmed by oxidative stress. In addition, female Sprague Dawley rodents that received diclofenac (DFC) experienced oxidative stress. TAFE MgO NPs decreases oxidative tissue damage and restore in vivo pressure to normal. Most importantly, TAFE MgO NPs regulates biochemical factors in order to restore the structure and function of the liver, kidney, and small intestine. The clotting time of platelet-rich plasma increased in the control group from 193 seconds to 885 seconds as a result of TAFE MgO NPs' anticoagulant activities. The thrombosis process was slowed by TAFE MgO NPs while thromboplastin time and prothrombin time were partially activated. This suggests that both the intrinsic and extrinsic coagulation processes include the coagulation cascade. Adenosine diphosphate (ADP)-induced platelet aggregation is prevented by TAFE MgO NPs. At the test concentration of 100 mg/kg body weight, TAFE MgO NPs did not show hemolytic, hemorrhagic, or edematous capabilities, indicating nontoxic qualities. In conclusion, TAFE MgO NPs reduced oxidative stress caused by diclofenac (DFC) and sodium nitrite (NaNO2) in both in vitro and in vivo experimental scenarios (12).

➢ **Chinnathambi A et al., 2023.** In this study was to evaluate the larvicidal and pupicidal capabilities of Tarenna asiatica methanol leaf extract against Aedes aegypti larvae. The results of this work suggest that zinc acetate dehydrate can be converted into zinc oxide nanoparticles using the methanol leaf extract of T. asiatica. The characteristics of the photosynthesized nanoparticles were determined using common analytical methods such as the UV-visible spectrophotometer, Fourier-transform infrared spectroscopy, X-ray Diffraction analysis, scanning electron microscope, and energy dispersive X-ray. The synthesized zinc oxide nanoparticles were spherical and ranged in size from 22.35 to 31.27 nm. These nanoparticles showed notable pupicidal action in addition to strong larvicidal activity against Aedes aegypti larvae in the second, third, and fourth stages. These results indicate that Terenna asiatica leaf extract in methanol produced zinc oxide nanoparticles
that could be used to create mosquito repellents (13).

CONCLUSION

Tarenna asiatica (L.) Kuntze ex K. Schum emerges as a valuable botanical resource with promising pharmacological potential. However, further research is warranted to elucidate its precise mechanisms of action, safety profile, and clinical efficacy. This review provides a foundational understanding of Tarenna asiatica and serves as a guide for future investigations into its utilization in herbal medicine and drug development.

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