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A WILD TRADITIONAL MEDICINAL PLANT ANGEL'S TRUMPET (*BRUGMANSIA SUAVELENS* FAMILY- SOLANACEAE): AN OVERVIEW

Alka Tailwal *, Arvind Negi and Vinita Chauhan

Department of Pharmacognosy, GRD (PG) IMT, Dehradun - 248001, Uttarakhand, India.

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Correspondence to Author:
Alka Tailwal

Department of Pharmacognosy, GRD (PG) IMT, Dehradun - 248001, Uttarakhand, India.

E-mail: alkatailwal99@gmail.com

ABSTRACT: *Brugmanisa suaveolens*, also known as the angel's trumpet and a member of the Solanaceae family, is found throughout Asia, India, Europe, Australia, and North and South America. This study looks at current information on the distribution, phytochemistry, pharmacology, and toxicology of *Brugmansia suaveolens* (Solanaceae) utilizing the extracts or chemical compounds at this time, as found in various search engines. This plant has been used in traditional medicine throughout cultures as a muscle relaxant, nematicide, aphrodisiac, hallucinogen, and treatment for inflammation, rheumatism, asthma, and allergies. Hyoscyamine, a tropane alkaloid, is a key bioactive component of the plant with anticancer action. Additionally, hazardous consequences such as severe anticholinergic symptoms like delirium, hallucinations, and psychosis may be caused by this herb. Different chemical substances have been detected in the plant's flowers, fruits, stems, and roots, including alkaloids, volatile chemicals (mostly terpenes), coumarins, flavonoids, steroids, and hydrocarbons. Atropine and scopolamine are primarily responsible for the plant's toxicity. According to pharmacological research, an aqueous extract has an antinociceptive impact on mice. The ethanolic extract, on the other hand, exhibited nematocidal action *in-vitro*.

INTRODUCTION: The huge eudicot family Solanaceae, which has around 2,500 species and is found in both tropical and temperate climates, is primarily indigenous to Central and South America. Additionally, it contains significant plants grown worldwide for food, medicine, and ornamentation. The latter two categories also apply to the South American genus *Brugmansia* Pers., which has seven species found in Venezuela, Colombia, northern Chile, and southeast Brazil [1].

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This herb has been used in traditional medicine throughout cultures as a nematicide, aphrodisiac, analgesic, muscle relaxant, sleep aid, and treatment for inflammation, rheumatism, and asthma [2]. Different chemical components, including alkaloids, volatile chemicals (mostly terpenes), coumarins, flavonoids, steroids, and hydrocarbons, have been found and used in the plant's flowers, fruits, stems, and roots.

Depending on the biotic and abiotic factors that the plant is exposed to, the concentration of the various chemicals fluctuates. Both as a spontaneous species and as a decorative plant, *Brugmansia suaveolens* (Humb. and Bonpl. ex Willd.) Bercht. and J. Presl is widely distributed worldwide, mostly in regions with climates ranging from tropical and subtropical

to temperate [3]. It is a member of the Solanaceae family, and according to The Plant List, 12 species, including hybrids and a subspecies, are recognised in this genus (*Brugmansia arborea*, *B. candida, B. cubensis, B. dolichocarpa, B. insignis, B. longifolia, B. pittieri, B. rubella, B. sanguinea, B. sanguineasubsp*) [4].

Ethnobotany: Despite being primarily employed as a hallucinogen in shamanic ceremonies by various tribes in Latin America, including several ethnic groups from the Amazon of Peru and Ecuador, *B. suaveolens* is also utilized in traditional medicine. It is used externally by the Inga people of Colombia to fight off the evil spirits that cause insomnia [5]. Due to their ease of growing and the creation of their distinctive floral smell at twilight, which reaches its highest peak at 21:00, many of these species are principally valued as ornamentals [6]. However, the Spanish were the ones who initially employed these plants medicinally in colonial times, using them to cure rheumatism, infections, and asthma [7]. For sores, to heal wounds without leaving scars, to treat pain generally, especially chest pain [8], to treat abscesses, dermatitis, and fungal infections of the skin [9], to treat snake bites, to relieve toothache, to treat inflammation from trauma, to reduce general body inflammation, to treat toothache, to treat diarrhoea, gonorrhoea, and to treat loss of appetite. Eye pain and coughing are treated with flower buds [10, 11].

Phytochemical Properties: This healing species has been the subject of chemical investigations since 1996. Identified as amines, carbohydrates, alkaloids, phenolic chemicals, flavonoids, steroids, terpenoids, tannins, anthraquinone glycosides, saponins, and triterpenes [12, 13], these investigations were the first qualitative on groupings of components. The ethanolic extract of the flowers was also used to quantify the alkaloids (5.903 _ 0.01333 mg/g), phenolic compounds (3.435 _ 0.0110 mg/g), and flavonoids (9.945 _ 0.0256 mg/g) [12]. The concentrations of these substances can alter, much like the volatile chemical profiles of living flowers, which are constantly changing due to both internal (genetic) and environmental (light, temperature, and water stress) variables. Cut flowers experience a quicker degeneration and a loss of volatile compounds [14]. Attacks by herbivores and diseases (viruses, bacteria, fungus, and nematodes) are other variables that have an impact on it. Drawings of the structures of organic chemical compounds were created using the Marvin programme [15].

Alkaloids: Tropane alkaloids contain cancer-preventing properties. Therefore, further research should be done in this area about this population. 59 alkaloids have been found in the mature flowers, as well as in the juvenile flowers and fruits, corolla, flowers, roots, and flower nectar, making it one of the most researched plants chemically [16, 17].

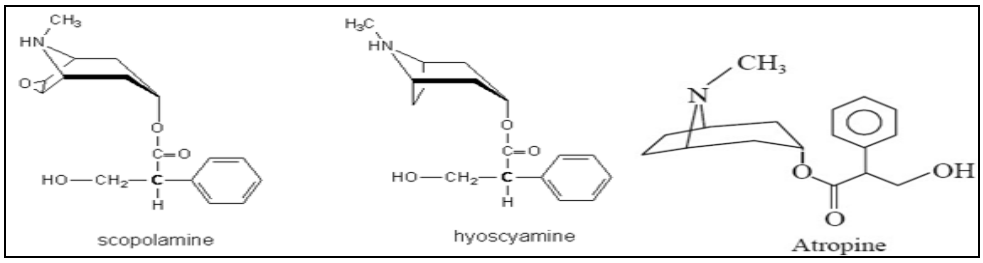

FIG. 1: PART USED: RIPE & IMMATURE FLOWER ROOT CULTIVATION, COROLLA ROOT CULTIVATION, COROLLA [18, 19]

Volatile Compounds: In the flowers and leaves, 50 volatile compounds have been identified, most of which are found in the flowers.

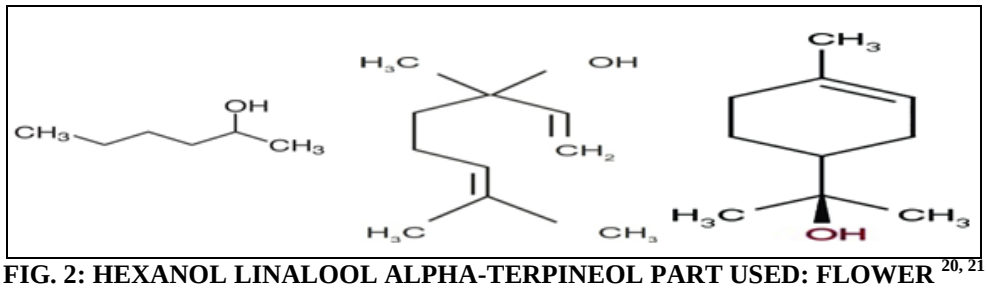

FIG. 2: HEXANOL LINALOOL ALPHA-TERPINEOL PART USED: FLOWER [20, 21]

Steroids: Three Steroids have been identified in the flowers and leaves.

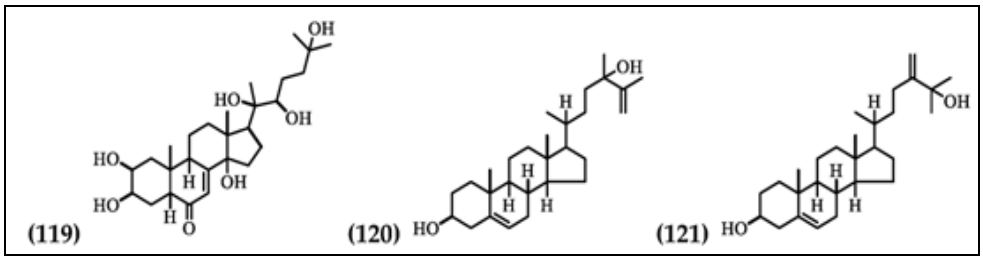

FIG. 3: 20-HYDROXYECDYSONE (FLOWER) 120. PHYSALINDICANOL A (LEAVES) 121. PHYSALINDICANOL B (LEAVES) [20, 22]

Hydrocarbons: Hydrocarbons the presence of four hydrocarbons in *B. suaveolens* has been identified only in the flowers.

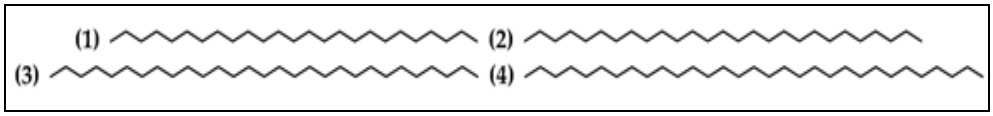

FIG. 4: 1. PENTACOSANE (FLOWER) 2. HEPTACOSANE (FLOWER) 3. NONACOSANE (FLOWER) 4. HENTRIACONTANE (FLOWER) [23]

Phenolic Compounds, Coumarin, and Flavonoids: A glycosylated phenolic compound, a coumarin, and seven flavonoids have been identified, in the flowers and leaves.

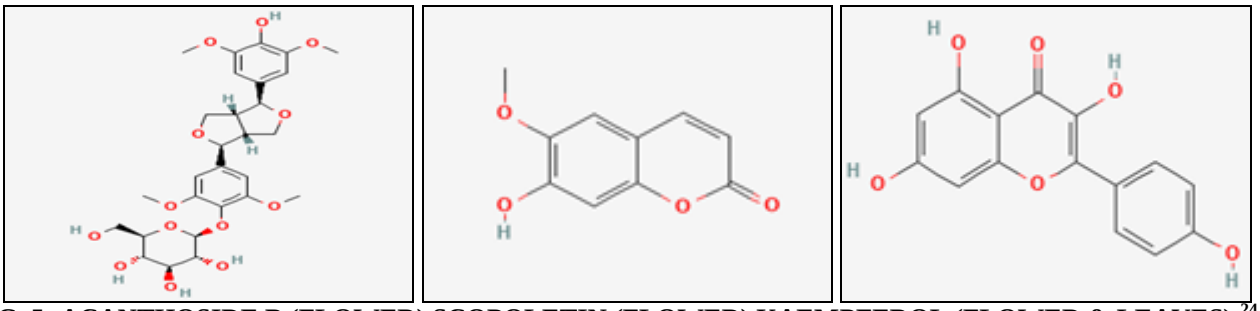

FIG. 5: ACANTHOSIDE B (FLOWER) SCOPOLETIN (FLOWER) KAEMPFEROL (FLOWER & LEAVES) [24, 25]

Plant Profile [26, 27]**:**

FIG. 6*: BRUGMANSIA SUAVEOLENS*

Common Name: Angel's tears and snowy angel's trumpet.

Botanical Name: *Brugmansia suaveolens.*

Divison: Mangnoliophyta- Flowering plants.

Class: Mangnoliopsida.

Order: Solanales

Kingdom: Plantae

Subkingdom: Tracheobionta

Superdivision: Spermatophyta

Tribe: Datureae

Family: Solanaceae

Genus: Brugmansia

Species: *B. suaveolens*

Flowering Time: October-February.

Ecological Note: Extremely rare from Mt. Abu.

Distribution: Australia, Brazil, California, Central America, Florida, Greece. India, Kenya, Mexico, Portugal and Sri Lanka.

Indian Distribution: Andhra Pradesh, Assam, Karnataka, Maharashtra, Nagaland, Tamil Nadu, Tripura, Uttarakhand and West Bengal.

Morphological Features: In terms of form and chemistry, the genus Brugmansia and the name Datura are closely related. The majority of the morphological traits are similar in both, and the main distinctions between them are found in the habit and fruit traits. *Datura ceratocaula* is a semi-aquatic hollow-stemmed prostrate creeping plant that is only found in Mexico and Central America. Due of its distinctive combination of traits, it is regarded as the connection between shrubby Brugmansia and herbaceous Datura [28, 29]. The leaves are ovate-lanceolate, green, deciduous, alternating, petiolate (up to 12.2 cm long), simple, acute-acuminate at the tip, asymmetric, and cuneate at the base. The axillary, solitary flowers grow on a 3.3–4.7 cm long peduncle that is covered in multicellular appressed trichomes. The 5-lobed, gamosepalous calyx has a tube that is 6.0–6.8 cm long [30].

Pharmacological Activity & Toxicity: Many Latin American nations have reported using *Brugmansia suaveolens* in traditional medicine, but the earliest reports date back 22 years [31]. Future research is still possible because the plant has received very few pharmacological studies.

Toxicity: The content of the alkaloids linked to the plant's toxicity might grow or decrease depending on a number of circumstances (climatic and seasonal). Its involvement in poisoning has been observed in numerous regions of the world, and other species, including *B. candida*, *B. sanguinea*, and *B. candida*, are regarded as poisonous in some countries, such as Mexico, especially their seeds [32]. It is documented that an intake of 4 to 5 g of raw leaf, or just a seed, can cause a child to die. The signs and symptoms of Angel's Trumpet poisoning are mydriasis, dry mouth, delirium, reddened skin, dry skin, agitation/aggressiveness, reduced bowel sounds, ileal paralysis, drowsiness, visual hallucinations, tachycardia, urinary retention, fever, increased systolic bloodpressure, a Glasgow Coma Scale (GCS) of <12, vertigo, decreased temperature and difficulty in breathing prior to coma [33]. Unusual poisoning occurred in a five-year-old boy who consumed flowers; consequently, unilateral tonic pupils and Guillain-Barré syndrome were observed [34]. Common causes for plant related poisoning include accidental ingestion, misuse as herbal products, suicidal attempts and deliberate abuse of hallucinogenic plant substances. Accidental poisoning with datura and Bs is by far the most common incidence in Asian countries with wrongful use of traditional medicines. Whereas in Central and North America, Bs toxicity is mostly due to abuse ingestion, especially among the younger [35].

Antigenotoxic Activity: The extract of the flowers of *B. suaveolens* through the micronucleus assay showed: Genotoxic activity at doses of 250, 500 and 1000 mg / kg and showed antigenotoxic activity at doses of 250 mg / kg. Further studies are needed with this plant to have a more complete assessment of the dangers that the plant can offer and its applicability in the treatment of diseases [33]. In some studies that evaluated antigenotoxic potential, the results showed that smaller doses were able to inhibit the effect of the substances used for the positive control [36].

Cytotoxicity: Studies of the cytotoxic evaluation of the aqueous extract of *B. suaveolens* were carried out in the Brine-shrimp model (Artemia sp., Artemiidae) during 24 h, the concentrations of 1000, 500, 250, 125,62.5, 31.25, and 0 (_g/mL)

were evaluated. An LC50 of 106 g/mL was obtained [37].

Antinociceptive: The aqueous extract of *B. suaveolens* flowers was administered at 100 and 300 mg/kgi doses.p. They significantly inhibited ($p < 0.05$) the induced contortions and increased the percentage of inhibition by acetic acid to 0.6% (3.0 _ 0.8 and 94.9%, and 0.6 _ 0.5 and 99%, respectively). Diclofenac 5 mg/kg i.p (43.4 _ 3.5 and 25.8%) was used as a positive control. An increase in the latency time was observed in the formalin test (20 _L of 2.5%); in the first phase (0–5 min), with a dose of 100 mg/kgm (15.6 _ 4.2 s and 63.3%) and 300 mg/kg (0.3 _ 0.3 s and 98.6%) and diclofenac (43.6 _ 7.0 s and 0%), and the second phase (20–25 min) with a dose of 100 mg/kg (7.5 _ 2.8 s and 82.2%) and 300 mg/kg(0.0 _ 0.0 s and 100%) and diclofenac (7.0 _ 2.8 s and 69.6%) in male Swiss albino mice. The hot plate and tail dip tests 38 also observed an increase in the latency time. In another study of the aqueous extract of flowers of *B. suaveolens* on the probable antinociceptive mechanism of the 300 mg/kg dose, a mechanism on benzodiazepine receptors was found. Flumazenil (5 mg/kg, i.p.) was used as an antagonist [39].

Nematicide: The ethanolic extract of flowers at 1000 mg/L concentration showed a 64% *in-vitro* nemato cidal activity against Meloidogyne incognita within 72 h. In another study of the ethanolic extract of aerial parts (flowers, flowers, and stems), a 100% larvicidal activity at a dilution of 12.5 mg against *Ancylostoma* spp was shown [40].

Antimicrobial: The antibacterial activity of the aqueous extract of *B. suaveolens* flowers against *Bacillus thurigiensis* was evaluated in one study and showed no activity [41].

Muscle Relaxer: *Brugmansia suaveolens* ethanol extract inhibits rabbit smooth muscle contractility at 100% at a 75.5 g/Ml 31 concentration.

CONCLUSION: This review details the distribution and ethnomedical, phytochemical, pharmacological, and toxicological uses of *B. suaveolens* worldwide. The scientific investigations that have been carried out to date are scarce; the analgesic, cytotoxic, nematicidal, and antimicrobial activity has been studied. However, regarding it's chemistry, it is important to highlight that 125 compounds have been reported and identified, and a high percentage are not associated with pharmacological activity. Ethnomedicaluses reported worldwide include its uses to treat pain, insomnia, rheumatism, infections, asthma, inflammation, sores, wounds, abscesses, dermatitis, snakebites, loss of appetite, coughs, and an aphrodisiac. From this empirical and traditional knowledge in different countries, the scientific validation of this plant species emerges as a great area of opportunity, which provides an opportunity for interdisciplinary collaboration between different research groups.

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CONFLICT OF INTEREST: Nil

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