the poison®

2025 | Vol. 2 | No. 2: 9-13

REVIEW

Poisoning by *Brugmansia arborea* (L.) Steud.: Plant characterization and toxicological profile

Olga A. Mutti*

Former toxicologist at the National Poison Center (CNI) - 'Prof. Alejandro Posadas' National Hospital, El Palomar, Buenos Aires, Argentina. Guest lecturer of the First Chair of Toxicology, Faculty of Medicine, University of Buenos Aires (UBA), Buenos Aires, Argentina.

*olgamutti@yahoo.com.ar

Submitted: 22/04/2025 - Accepted: 16/05/2025 - Published: 30/06/2025 - DOI: https://doi.org/10.62129/JCPX5698

ABSTRACT. Poisoning by *Brugmansia arborea* constitutes an underestimated public health issue, especially in regions where the plant is widely accessible. This species contains high concentrations of tropane alkaloids, primarily responsible for inducing an anticholinergic toxidrome with potentially severe clinical manifestations. A narrative review was conducted using a targeted search of the scientific literature on the toxicological, pharmacological, clinical, and ethnobotanical aspects of *Brugmansia arborea*. Sources included peer-reviewed articles, academic books, and case reports published in English and Spanish between 1976 and 2024. Enhanced understanding of *B. arborea* toxicity and its toxic effects is essential to improve diagnosis, clinical management, and prevention strategies.

Key words: *Brugmansia arborea; Tropane alkaloids; Solanaceae; Plant poisoning; Anticholinergic syndrome.*

Brugmansia arborea (L.) Steud., commonly known as *floripondio*, is a plant belonging to the *Solanaceae* family, widely distributed throughout the Andean regions of South America. Its flowers contain tropane alkaloids such as scopolamine, atropine, and hyoscyamine, which exert anticholinergic effects. Although traditionally used for ornamental and ethnobotanical purposes, accidental or intentional ingestion can lead to severe clinical manifestations. This review aims to characterize *B. arborea* and describe the clinical features associated with its toxicity.

MATERIALS AND METHODS

This narrative review was based on a comprehensive, targeted search of the scientific literature, focusing on the toxicological, pharmacological, clinical, and ethnobotanical aspects of *B. arborea*. Sources included peer-reviewed journal articles, academic books, and case reports. Keywords used in various combinations included *Brugmansia arborea*, *tropane alkaloids*, *scopolamine*, *atropine*, *anticholinergic syndrome*, and *plant poisoning*. Relevant publications in English and Spanish from 1976 to 2024 were considered. In addition, authoritative reference texts in toxicology and pharmacognosy were consulted to complement and contextualize the findings.

DISCUSSION

General aspects

According to Schulz AG, *B. arborea* is known by multiple common names across different regions, reflecting both its traditional uses and its cultural significance.[1] Common terms include *floripondio* (Argentina, Ecuador, Bolivia, Chile, and Mexico); *trompeta de ángel*, *toloache*, and *borrachero* (Colombia); *floripón*, *campana*, and *flor de campana* (Cuba, Puerto Rico, and the Dominican Republic); *campanita* (Venezuela); and *toá* (Western Amazon). The term *angel's trumpet* is the most widely used and internationally recognized. The expression *burundanga* is a frequently used colloquial word in Latin America, commonly referring to the administration of psychoactive substances—most often alcoholic beverages or benzodiazepines, and less frequently scopolamine-containing preparations—with the intent to facilitate criminal acts such as robbery or sexual assault, a phenomenon known as 'chemical submission.' Although its exact etymological origin remains uncertain, it is possibly derived from African, Indigenous, or onomatopoeic influences and is thought to mean 'brew' or 'potion.'

B. arborea grows as a perennial or semi-perennial shrub, native to Central America, the Caribbean, and South

Figure 1. Specimens of *B. arborea* in the flowering stage. A. Shrub photographed in its natural habitat; B. *B. arborea* flower in full bloom, showing its characteristic bell shape and pale coloration (Credits: author's own photographs).

America, extending as far south as the Patagonian Andes (Fig. 1, A and B). Parodi and Dimitri (1988) describe *B. arborea* as a species widely grown in Argentine gardens, valued both for its ornamental appearance and for the fragrance of its flowers.[2] Schultes and Hofmann (1982) report that species of the genus *Brugmansia* have traditionally been used in shamanic rituals due to their potent psychoactive and hallucinogenic effects.[3] Roig and Mesa (1988) document the presence of *B. arborea* in Cuba under various vernacular names, highlighting its integration into the region's popular botanical knowledge.[4] It is also worth noting that tree-like *Datura* species have been reclassified under the genus *Brugmansia*. All species produce large, trumpet-shaped, pendulous flowers and spineless fruits.

Botany and taxonomy

The generic name *Datura* derives from the poison called *dhât*, a toxic substance historically used in India by the Thugs—organized groups who specialised in stealing from and murdering wealthy travellers by blending in and gaining their trust. The genus name *Brugmansia* was assigned in honour of the botanist and physician Sebald J. Brugmans (1763–1819), a professor of natural history in Leiden, the Netherlands. The name *Brugmansia* was attributed by Ernst Gottlieb von Steudel in *Nomenclator Botanicus*. A homonymous and synonymous taxon was also proposed by Nils Gustav Lagertheim in *Deutsche Botanische Systematik*. In 1973, Tom E. Lockwood definitively separated the two genera in his doctoral thesis at Harvard University, a distinction later corroborated at a botanical congress in 1979.

B. arborea is a shrub reaching two to three metres in height. The leaves are ovate-lanceolate to oblong, entire or sinuately angled, pubescent, and can grow up to 20 cm long. The flowers are white, aromatic, pendulous, measuring 15 to 30 cm in length, with a laterally split spathaceous calyx. The fruit is an ovoid berry, approximately 6 cm by 4.5 cm, and spineless. The morphological features of this species are illustrated in Fig. 2.

Active compounds

According to Trease and Evans (1991), *B. arborea* contains tropane alkaloids with pronounced anticholinergic activity, which form the basis of its pharmacological effects and toxicological profile.[5] The main active constituents include hyoscyamine (a stereoisomer of atropine) and scopolamine (hyoscine), both of which are known to exert pronounced effects on the central (CNS) and peripheral (PNS) nervous systems. Similarly, Bruneton (2001) indicates that various *Brugmansia* species consistently contain these alkaloids, whose neurotoxic effects are well characterised in both clinical and experimental contexts.[6]

Although several species of *Brugmansia* are found in different regions, they all contain similar active alkaloids. For instance, *Brugmansia sanguinea* (Ruiz & Pav.), commonly found in Ecuador, is traditionally used for its dried leaves, which serve as a source of scopolamine for extraction and

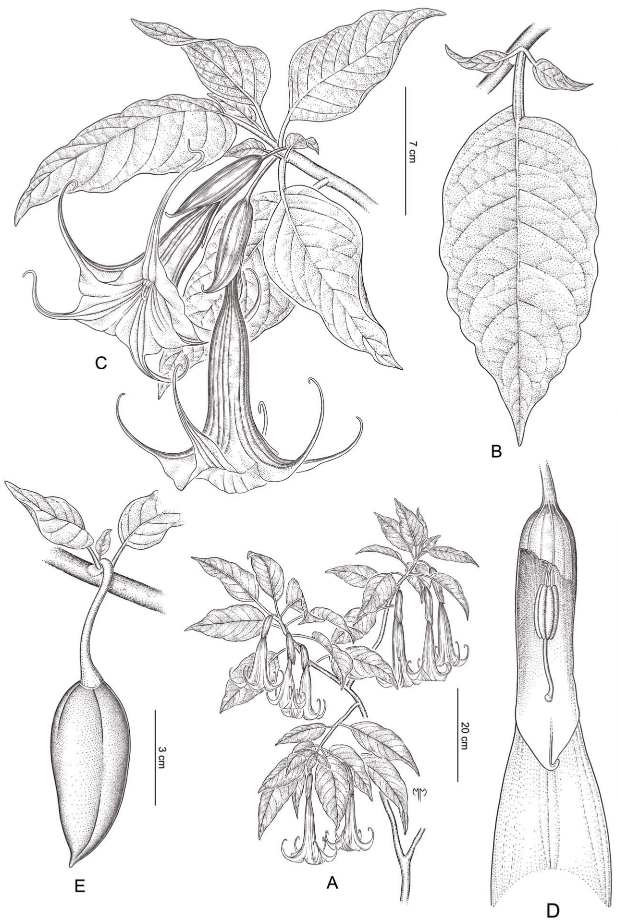

Figure 2. Botanical illustration of *B. arborea*. A. General aspect; B. Leaf, adaxial view; C. Portion of the inflorescence; D. Longitudinal section of the flower, stamens and style and E. Fruit (Credits: Marcelo A. Moreno – IBODA).

export. The productive lifespan of this plant is estimated to be approximately 10 years.

Pharmacodynamics and toxicodynamics

Atropine and scopolamine exert their pharmacological activity via competitive antagonism at muscarinic acetylcholine receptors (mAChRs), thereby inhibiting cholinergic neurotransmission within both CNS and PNS. This antagonism leads to a dose-dependent modulation of parasympathetic tone.

Atropine demonstrates a central excitatory profile at higher concentrations, attributable to its limited but sufficient CNS penetration, resulting in restlessness, agitation, and, in some cases, seizures. Scopolamine, by contrast, exhibits higher lipophilicity, facilitating more rapid and extensive CNS entry, where it acts predominantly as a central depressant, producing sedation, anterograde amnesia, and—at toxic levels—confusion, hallucinations, and psychomotor agitation.

Peripherally, both alkaloids block M1–M5 receptor subtypes in smooth muscle, cardiac tissue, and exocrine glands, producing the hallmark signs of antimuscarinic toxicity: mydriasis, cycloplegia, xerostomia, anhidrosis, tachycardia, urinary retention, and decreased gastrointestinal peristalsis. The clinical severity of intoxication correlates with receptor affinity, individual pharmacokinetics, and cumulative exposure, especially when co-administered with other anticholinergic agents.

Poisoning

Exposure. Poisoning may result from accidental ingestion, recreational purposes, or therapeutic use in adults—particularly due to the plant's antiasthmatic properties. The most common routes of administration include smoking dried leaves in the form of cigarettes or consuming infusions made from the flowers. *B. arborea* is among the main plants involved in pediatric poisonings associated with the popular use of medicinal herbs in Argentina.[7]

Clinical presentation. Symptoms depend on the dose ingested and potential co-exposure to other substances. Clinical manifestations may include dryness of mucous membranes, headache, facial flushing, occasional hyperthermia, tachycardia, mydriasis, blurred vision, hallucinations, delirium, agitation, motor incoordination, seizures, and, in severe cases, coma.

Identification. In suspected cases of plant-derived poisoning, it is essential to collect a sample of the material involved to allow for accurate botanical identification. This step is particularly important in countries like Argentina, where diverse phytogeographic regions result in significant variation in vernacular plant names. Identification should be performed by trained personnel as close as possible to the site of care. Establishing collaboration between medical and botanical experts is key, and the development of a small reference herbarium may greatly facilitate timely diagnosis and management in future incidents.

The plant material shown in Fig. 3 was brought in by an adult patient who had ingested an infusion prepared with three *Brugmansia* flowers to relieve an asthma attack. On admission, the patient presented with a fixed gaze, disorientation in time and space, and slow ambulation assisted by a family member. He exhibited mydriasis, was normotensive, and pulmonary auscultation revealed no wheezing. Management included observation in the emergency department and oral hydration. He evolved favorably.

Figure 3. Dried flowers of *B. arborea*, preserved for morphological and phytochemical analysis. The tubular structure remains intact, and remnants of glandular trichomes are visible on the surface (Credits: author's own photographs).

Treatment. Management is primarily supportive. Intravenous fluid therapy may be necessary, and benzodiazepines are often indicated to control agitation. Continuous monitoring and symptomatic treatment should be provided as needed based on clinical severity. Most patients experiencing anticholinergic toxicity recover well with supportive care alone; however, some may require antidotal treatment with physostigmine.[8,9] It is recommended for cases presenting significant central anticholinergic symptoms, such as moderate to severe agitation or delirium. It should be avoided if there is suspicion of a diagnosis other than anticholinergic poisoning, a QRS interval exceeding 100 milliseconds, or in cases of tricyclic antidepressant overdose. Additional relative contraindications include reactive airway disease, intestinal obstruction, seizure disorders, and cardiac conduction abnormalities. Physostigmine seems more effective than benzodiazepines for treating agitation and delirium caused by anticholinergic toxicity.[10-12] While patients with mild symptoms may improve with low doses of benzodiazepines, those experiencing moderate to severe agitation are more likely to benefit from physostigmine.

The toxicologist requires collaboration with other disciplines such as anthropology, agronomy, ethnobotany, zoology, mycology, and chemistry, which are essential for identifying materials and providing information on their uses and active compounds. The diverse training backgrounds of professionals from different fields enrich the approach to solving complex problems. In today's highly specialized and fragmented scientific landscape, only an interdisciplinary team can maintain scientific efficiency.

CONCLUSIONS

B. arborea poisoning represents a significant public health concern due to its potent anticholinergic tropane alkaloids, which can cause severe and potentially fatal clinical presentations if not properly managed. Its widespread availability and traditional use increase the risk of accidental or intentional exposure, particularly among children and adolescents. Early recognition and supportive treatment are essential to improve patient outcomes. Strengthening community education and healthcare professional training is crucial for effective prevention and management. Furthermore, enhanced documentation and research are needed to better understand its toxicological profile and to develop more precise clinical guidelines.

Conflicts of interest

The author declares no conflicts of interest.

REFERENCES

1 Schulz AG. Nombres comunes de las plantas. Edición de los Gobiernos de la Provincias del Chaco y Corrientes; 1976

2 Parodi L, Dimitri MJ. Enciclopedia argentina de agricultura y jardinería. Buenos Aires: Ed. ACME SACI; 1988

3 Schultes RE, Hofmann A. Plantas de los dioses: orígenes del uso de los alucinógenos. México: Fondo de Cultura Económica; 1982

4 Roig y Mesa JT. Diccionario botánico de nombres vulgares cubanos (3rd ed.). La Habana: Ed. Científico-Técnica, Ministerio de Cultura; 1988

5 Trease GE, Evans WC. Farmacognosia. México: Editorial Interamericana; 1991

6 Bruneton J. Farmacognosia: fitoquímica, plantas medicinales (2nd ed.). Zaragoza: Ed. Acribia; 2001

7 Mutti OA. Intoxicación por plantas de la Medicina Popular. Enfoque multidisciplinario. Boletin Farmacoter Toxicol. 2002;9:16-22

8 Beaver KM, Gavin TJ. Treatment of acute anticholinergic poisoning with physostigmine. Am J Emerg Med. 1998;16(5):505-7. Available from: https://doi.org/10.1016/s0735-6757(98)90003-1

9 Dawson AH, Buckley NA. Pharmacological management of anticholinergic delirium - theory, evidence and practice. Br J Clin Pharmacol. 2015;81(3):516-24. Available from: https://doi.org/10.1111/bcp.12839

10 Wang GS, Baker K, Ng P, Janis GC, Leonard J, Mistry RD, Heard K. A randomized trial comparing physostigmine vs lorazepam for treatment of antimuscarinic (anticholinergic) toxidrome. Clin Toxicol. 2020:1-13. Available from: https://doi.org/10.1080/15563650.2020.1854281

11 Burns MJ, Linden CH, Graudins A, Brown RM, Fletcher KE. A comparison of physostigmine and benzodiazepines for the treatment of anticholinergic poisoning. Ann Emerg Med. 2000;35(4):374-81. Available from: https://doi.org/10.1016/s0196-0644(00)70057-6

12 Watkins JW, Schwarz ES, Arroyo-Plasencia AM, Mullins ME. The Use of Physostigmine by Toxicologists in Anticholinergic Toxicity. J Med Toxicol. 2014;11(2):179-84. Available from: https://doi.org/10.1007/s13181-014-0452-x