



Received on 27 July 2023; received in revised form, 25 August 2023; accepted, 30 August 2023; published 31 August 2023

## ETHNOMEDICINAL AND PHARMACOLOGICAL IMPORTANCE OF *ATROPA BELLADONNA*: A REVIEW

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### Keywords:

*Atropa belladonna*, Atropine, Hyoscyamine, Medicinal uses, scopolamine

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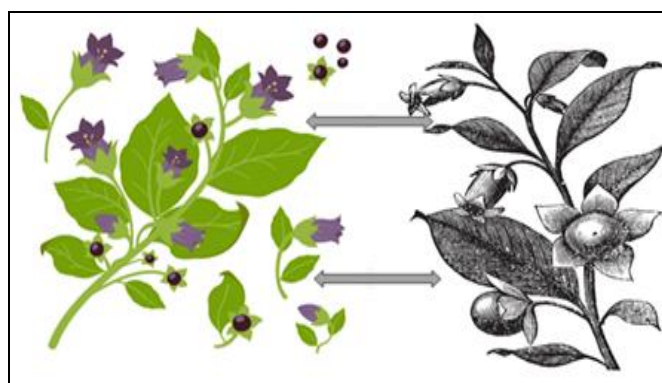
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**ABSTRACT:** Humans have used flora's resources to cure a variety of ailments for thousands of years. *Atropa belladonna* is currently a vital plant in research and medicine due to the compounds it contains. *Atropa belladonna* is a perennial plant that is exceedingly dangerous. It originates from the Solanaceae family. Deadly Nightshade is the common name for *Atropa belladonna*. The medicine "Atropine" is mostly derived from it. They are poisonous because they contain alkaloids like scopolamine and hyoscyamine. However, everyone agrees that the size is similar to a typical cherry and that the fruit of the atropa is neither sweet nor bitter tasting. Some individuals find the smell of the entire plant to be particularly sickening. These are employed in a variety of industries, including medicine, science, and cosmetics. This plant requires rich, wet soil, a lot of fertilizer, and a weed-free habitat. primarily used as a medication to treat skin wounds, during operations, reduce muscle discomfort, enlarge pupils, and treat disorders of the brain and nerves, such as whooping cough, asthma, neuralgia, sciatica, and gout. Before coronary care units were developed, this was employed in cardiology to treat bradycardia and heart block following myocardial infarction. Many medical conditions have been treated with belladonna in modern times. This article discusses how *Atropa belladonna* is used medically.

**INTRODUCTION:** Nature has a special way of protecting us from the awful effects of many diseases by providing its elements with a variety of bioactivities. Traditional knowledge is a special type of practice or system of procedures that emerged in antiquity and was passed down through the ages by family dynasties, local communities, and certain clans<sup>1</sup>. Ethnomedicine refers to conventional medical treatments that consider cultural viewpoints on health, and illness, incorporating treatment modalities and healthcare strategy as a result, the old repository of traditional knowledge forms the basis for ethnomedicine.

Ayurveda, which has its roots in India, is one of the most ancient medical systems based on accepted knowledge<sup>2</sup>. *Atropa belladonna*, often known as the Deadly Nightshade, is a plant shrouded in rumor, dread, and awe **Fig. 1**. Ancient Greeks and Romans were aware that it contained a toxin that may be fatal. It was commonly utilized in the middle Ages by witches, sorcerers, and expert poisoners.



**FIG. 1: PLANT OF *ATROPA BELLADONNA***

<b>QUICK RESPONSE CODE</b> 	<b>DOI:</b> 10.13040/IJPSR.0975-8232.IJP.10(8).448-53
	Article can be accessed online on: <a href="http://www.ijpjournal.com">www.ijpjournal.com</a>
<b>DOI link:</b> <a href="https://doi.org/10.13040/IJPSR.0975-8232.IJP.10(8).448-53">https://doi.org/10.13040/IJPSR.0975-8232.IJP.10(8).448-53</a>	

Later, due to its capacity to enlarge the pupils, Linnaeus classified its unique features as the species *belladonna* and the genus *Atropa*, the Fate that slices the thin woven life. L-atropine, a pure alkaloid, was isolated from the plant in the 1830s. With the help of this, the autonomic nervous system was better understood, and acetylcholine's role as a crucial neurotransmitter in mammals was discovered. When pure atropine became accessible, it resulted in many fatalities, whether they were accidental or caused by suicide<sup>3</sup>.

**Ethnopharmacological importance of *Atropa belladonna*:** According to Indian mythology, Lord Shiva has a particular affinity for the plant *Atropa belladonna*, often known as Belladonna. This perennial herb, which is a member of the Solanaceae family, may be found in Western Asia, some regions of North Africa, and Europe<sup>4</sup>. It is widely distributed in Purvanchal, Uttar Pradesh, India, and has significant medical and spiritual importance. The plant is poisonous and contains atropine alkaloids.

The FDA has not approved the use of synthesized Belladonna alkaloids, yet these are present in many prescription drugs. Belladonna was employed by medieval midwives to prevent miscarriages in accordance with the homeopathic principle, which holds that poison is destroyed by poison (vish-vishmaushadham)<sup>5</sup>. Scientific understanding of the ideal Belladonna dose is still insufficient. When using Belladonna for therapeutic purposes, it's crucial to adhere to the instructions on the product label and get advice from a physician or chemist on the right dosage<sup>6</sup>.

Hay fever, arthritis, asthma, hemorrhoids, Parkinson's disease, and spasms are among the additional diseases that belladonna is used to treat<sup>7</sup>. Since, the amounts of Belladonna derivatives in homeopathic treatments are extremely tiny and far below toxicity standards, belladonna is considerably safer when utilized in these products. Belladonna extract is actually water-diluted in homeopathic medicines, which makes it far safer to use than raw extract, just like with any other plant or medicine. The Belladonna extract is useful for abortion, according to Charaka. Despite the lack of any supporting scientific data, belladonna formulations are utilized in

homeopathy to treat a variety of ailments. The most popular mixture is diluted to the 30C level in the homeopathic notation for use in clinical settings and scientific experiments<sup>8</sup>.

**Ethnopharmacological importance of *Atropa belladonna*:** Its medical usage is rather new and the ancients only knew it as a poisonous herb. Additionally, it appears that Chinese and Indian doctors are unaware of this herb. But in the 16<sup>th</sup> century, Italian women used its pupil-dilating properties<sup>9</sup>. Not all species are similarly impacted by this plant; for example, rabbits may consume it without consequence and their pupils can enlarge when their own urine is applied. Snails and slugs eat its leaves, and birds may eat its fruits without it having any negative effects on their eyes<sup>10</sup>. It is used to treat arthritis, gout, stomach and intestinal ulcers, pleurisy, asthma, pleurisy-related symptoms, and any symptoms of nerve origin by drying up fluids inside the body and acting as an antispasmodic and anti-inflammatory. Its leaves are used externally as an anesthetic and analgesic.

It is also used to reduce perspiration and milk production. Belladonna stimulates the heart, lungs, and spine at modest doses and has mydriatic, antispasmodic, anodyne, diuretic, and lactifuge properties<sup>11</sup>. It is utilized in Ayurveda for the treatment of Cough, pain, asthma, etc. In excessive amounts, however, it depresses the medulla's respiratory center. Belladonna extract is used orally to treat excessive sweating and administered topically to treat discomfort. The United States. For the creation of tincture, extract, and fluid extract, belladonna leaves were utilized<sup>12</sup>.

**Atropine Poisoning:** Poisoning, whether intentional or unintentional, happened after the isolation of the pure alkaloid. Witthaus's collection of clinical cases from 1911 has the most clinical cases ever compiled. He talked about a group of 682 patients (or people). Preparations of belladonna (eye drops, plasters, or liniments) produced 379 cases, whereas the pure alkaloid atropine caused 303. There were also 37 suicides and 14 homicides among these poisonings, with more than 500 of them being determined to be unintentional. There were 60 recorded fatalities or almost 12% of all total deaths. Needless to say, obviously, this was before the advent of mechanical ventilation and

critical care. Atropine toxicity is now uncommon because of Witthaus' excellent series from 1911. Plasters, liniments, and eye drops have either been phased out or outlawed. Atropine supplies are becoming considerably more challenging to come by. Hospitals, pharmacies, research facilities, and pharmaceutical corporations are the main, if not only, customers of the medicine. As a result, in the course of their regular job, doctors, anesthetists, chemists, and research scientists can rather easily access pure alkaloids. Access to and availability of the material had a role in determining the course of the successful investigation that the police undertook, as we shall see in the instance of Dr. Agutter, which is discussed below. Children who ingest the plant's alluring blackberries still suffer the most prevalent sort of poisoning, but they often recover<sup>13-14</sup>.

#### **Clinical Signs and Symptoms of Poisoning:**

An unusual confluence of symptoms and indications occurs when atropine (or *Atropa*) is provided in overdose (by accident or intentionally), and they might be summed up as follows: "Hot as a hare, blind as a bat, dry as a bone, red as a beetroot and mad as a hen". When this unusual constellation is seen, the diagnosis is generally simple, and the only possible misdiagnosis is poisoning from another Solanaceae plant, such as henbane (*Hyoscyamus*) or thorn apple<sup>13-14</sup>.

#### **Phytochemicals Present in *Atropa belladonna*:**

Plants generate phytochemicals, often known as phytonutrients. These compounds are the fundamental building block for both the pharmacological and nutritional actions of plants. These substances also give plants a way to protect themselves from plant diseases. The class of bacteria, fungi, protozoa, and viruses includes the major pathogens<sup>15</sup>.

Common fruits and vegetables including broccoli, berries, carrots, tomatoes, garlic, seeds, and onions contain substantial amounts of these compounds that boost the body's immune system<sup>16</sup>. All plant components include volatile bases like pyridine and N-methylpyrrolidine as well as alkaloids, the majority of which being l-hyoscyamine, atropine, and hyoscyne in trace levels. Succinic acid, asparagine, and scopolin (-methylesculetin) are all present in the leaves. L-atropine, a pure alkaloid

from the plant, was first discovered in 1831<sup>17</sup>. Fresh, ripe fruit, fresh seeds, and fresh leaves have the most alkaloids. The leaves are the second most powerful when dried, followed by the unripe fruit and then the mature fruit. Prior to the onset of blooms, the root's alkaloid concentration is at its maximum. During extended periods of chilly and overcast weather, the entire plant is lacking in alkaloids. The maximum total alkaloid concentration in seeds, roots, and leaves is 0.8%, 0.7%, and 0.6%, respectively<sup>18</sup>. Osol mentioned 1.25% alkaloids in the leaf extract. Even more, alkaloids are present in the wood of the plant than in the mature fruits. Hellaridine, which makes up 0.002% of the root, acts similarly to atropine. Old, big stems contain little alkaloids. For the drug trade, roots must have a minimum of 0.45% USP and 0.4% BP and leaves must have a minimum of 0.35% USP and 0.30% BP<sup>19</sup>.

#### **Pharmacological Importance of *Atropa belladonna*:**

*Atropa belladonna* was used in plasters (and liniments) from the middle of the nineteenth century through the late 1950s. Druggists, apothecaries, and pharmaceutical chemists offered them for sale over the counter. Such drugs were well regarded by the general people since they frequently prevented pricey medical visits.

These treatments were utilized for a wide range of illnesses, such as acute mastitis, lumbago, myalgia, pleurisy, chronic rheumatism, neuralgia, and lumbago. They appeared to have some analgesic and anti-irritant properties and were less aggressive than those plasters that included mustard plant extract (*Brassica nigra* or *juncea*)<sup>20</sup>.

Pretreatment with water extract improved the early phases of cutaneous wound healing in rats by reducing inflammation, speeding up collagen formation, and significantly increasing wound stiffness in comparison to control tissues. Both the unrefined components and the raw seed extract lacked antibacterial strength. Greater anticholinergic effects from *A. belladonna* tincture than those expected by the plant's alkaloid content point to the presence of undiscovered compounds with significant biological activity in the leaves<sup>21</sup>. On stress-induced behavioral, immunological, and gastrointestinal changes, low dosages had notable

neurotropic and protective effects. Animals treated with methanol extract showed pronounced analgesic, anti-inflammatory, and sedative effects. while *S. aureus* and *E. coli* were resistant to the antibacterial effects of ethanol root extract. Sometimes combinations of different plants were employed<sup>22</sup>. The plaster that also contained an extract of monkshood (*Aconitum napellus*) is a well-known (or notorious) example. The lethal alkaloid aconitine, which can result in cardiac and respiratory collapse, is produced by this plant. It was rumored that murderers bought this lethal plaster. The two alkaloids, aconitine, and atropine, were then steeped off to create a toxic liquid that they would employ for their lethal actions<sup>23</sup>.

**Some Pharmacological Activities of *A. belladonna*:** The three most common alkaloids in this plant are atropine, scopolamine, and hyoscyamine. They cause delirium when administered in high enough dosages. Muscle relaxant *A. belladonna* is used to alleviate spasms in the stomach, intestines, and bile duct<sup>24</sup>. Additionally, it treats peptic ulcers and functions as an anesthetic, antidote to some insect bite poisons, nerve gas, and several mushroom toxins<sup>25</sup>.

Its alkaloid atropine is also an important substance since it can treat Parkinson's disease, asthma, whooping cough and hay fever, and is thought to control heartbeats. Belladonna lessens injuries, and paralysis, and enhances speech and mobility in people with crippling illnesses<sup>26</sup>. Atropine, a component of belladonna that dilates the pupil and is particularly effective in treating eye disorders, is present. To ease irritation and discomfort caused by neuralgia, gout, rheumatism, and sciatica, belladonna is applied as a lotion, plaster, or liniment.

It helps control excessive sweating caused by phthisis and other tiring disorders as well as excessive secretions that cause inflammation to subside. When administered to the heart area for the same reason, belladonna, in tiny dosages, combats cardiac palpitation and eases discomfort and suffering<sup>27</sup>. Belladonna leaves are administered topically to treat skin cancer symptoms and are smoked for the treatment of whooping cough and fake croup. The active components of belladonna, atropine, and

scopolamine, are anti-cholinergic, which means that they lessen the wheezing brought on by an asthma attack by blocking particular nerve impulses in the parasympathetic nervous system. The parasympathetic nervous system regulates a number of involuntary bodily functions and reflexes, including pupil dilation, gland secretion, and relaxation of the bronchioles in the lungs. Atropine should be taken with caution since high dosages might cause a deadly illness<sup>28</sup>.

***Atropa belladonna* as an Anticholinergic Herb:**

The root and leaves of *Atropa belladonna*, often known as belladonna or deadly nightshade, contain an alkaloid that inhibits muscarinic receptors. In human studies, this anticholinergic herb has been found to lower TLESR (Transient Lower Esophageal Sphincter Relaxation) and also reduce reflux episodes. In contrast to a local effect in the LES (Lower Esophageal Sphincter), atropine appears to act in the brain stem. Purified atropine has greater negative side effects, hence only whole-plant extracts are advised for GERD (gastroesophageal reflux disease) patients. 8–10 drops of a 1:5 tincture of belladonna leaf are usually taken with each meal. Although it is possible, mild dry mouth is not a cause to change the dosage. On the other hand, if some symptoms appear after consuming the herb, they may indicate an overdose<sup>29</sup>.

**CONCLUSION:** The current review demonstrates that *Atropa belladonna*, utilized as an ethnomedicinal remedy for the past three thousand years, is a highly effective medicinal plant in contemporary pharmacology. It is a powerful drug in contemporary pharmacology. The presence of alkaloids in the plant has been confirmed.

These facts allow us to recognize *Atropa belladonna* as one of the most significant medicinal herbs. Both allopathic and Siddha medicine use them. Due to its chemical composition, *Atropa belladonna* is currently a highly significant plant in research and medicine. The perennial grass *Atropa belladonna* is exceedingly toxic. Due to the presence of alkaloids like scopolamine and hyoscyamine, they are poisonous primarily used as a medication to treat skin wounds, during operations, reduce muscle discomfort, enlarge pupils and treat disorders of the brain and nerves,



such as whooping cough, asthma, neuralgia, sciatica and gout. Prior to the development of coronary care units, this was employed in cardiology to treat bradycardia and heart block following myocardial infarction. Researchers both now and in the future are interested in learning how many valuable medications may be derived from herbal plants. We must be aware of these plants and use them properly.

**ACKNOWLEDGMENT:** I thank the Department of Pharmaceutical Technology, University of North Bengal, and respective supervisor and seniors for their expertise and assistance throughout all aspects of our study and for their help in writing the manuscript.

**CONFLICT OF INTEREST:** The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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**How to cite this article:**

Das J and Sarkar BR: Ethnomedicinal and pharmacological importance of *Atropa belladonna*: a review. Int J Pharmacognosy 2023; 10(8): 448-53. doi link: [http://dx.doi.org/10.13040/IJPSR.0975-8232.IJP.10\(8\).448-53](http://dx.doi.org/10.13040/IJPSR.0975-8232.IJP.10(8).448-53).

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