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A Review on Ethno-Botany and Antimicrobial Properties of Four Species belonging to Family Solanaceae: An Alternate Source of Antimicrobials

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A B S T R A C T

One of the most important plant families in traditional medicine and human nutrition is the family Solanaceae. In the Solanaceae family, there are several plants that are rich in bioactive metabolites and have been used for centuries by many tribes. There has been a surge in interest in plant-derived antimicrobial phyto-molecules in recent years, raising the prospect of finding novel antimicrobial medicines to combat antibiotic resistance. Based on the inclusion and exclusion criteria, a systematic literature review was undertaken using a variety of databases. Solanaceae plants yielded phyto-molecules having antibacterial potential, which were found to be a part of the plants' natural defenses. Plant and human pathogens were both successfully combated with these compounds' antibacterial, antifungal, and antiviral properties. *Solanum nigrum*, *Datura metel*, *Withania somnifera* & *Physalis minima* are the most commonly studied genera for antibacterial potential. Comparable to other antimicrobials, phyto-molecules from Solanaceae had similar modes of action, such as altering membrane potential and permeability, the creation of membrane pores, and cell aggregates. It has long been known that plants in the genus Solanaceae have been utilized for medicinal and toxic purposes. Solanaceae phyto-molecules are the byproducts of chemical shields used by plants to defend themselves against microbes. Database review is intended to summarize documented phyto-molecules from plants in the Solanaceae family with antimicrobial potential, as well as to correlate their traditional and therapeutic usage with their reported antimicrobial effects.

Introduction

Antibiotic abuse or misuse is currently the primary cause of the ever-increasing resistance to antimicrobials (Chandra *et al.*, 2017). Antibiotic resistance is posing a major threat to world health, and new antimicrobial drugs are urgently needed to address it. Natural products have played an important role in the treatment of human ailments and as a possible source of new therapeutic agents from the beginning of time (Amedei and Niccolai, 2014). In the field of ethnopharmacology, a study of

indigenous treatments, the development of novel drugs from natural sources is critical (Holmstedt and Bruhn, 1983).

Herbal medicine is derived largely from plants, which also play an essential role in human health. Humans have been employing herbal plants to heal a variety of ailments for thousands of years (Sofowora, 1982). To learn about plants' economic and medical significance, ethnic people rely on what they see, what they hear from elders, and what they experience themselves. Ethnic populations gain greatly from the use of indigenous medicines. Secondary metabolites derived from herbs are mostly due to the plants' biological features. Most people in underdeveloped countries still rely on traditional, mostly herbal remedies for their primary treatment, according to the World Health Organization (Jain *et al.,* 2011). The World Health Organization (WHO) stated that roughly 25% of modern medications are derived from plant sources, while research on traditional medicinal herbal plants led to the discovery of 75% of herbal therapeutics. According to the World Health Organization (2002), about 21,000 plant species are known to have therapeutic use in various parts of the world.

For thousands of years, plants and their parts have been utilized to treat a variety of ailments (Abu-Rabia, 2005). Even in their most basic form, most medical medicines have been derived from plants throughout history (Krishnaraju *et al.,* 2005). Fluid extracts, derived from plant materials such as bark, roots, and leaves, are used to alleviate symptoms that contribute to disease progression (Cragg *et al.,* 2011)' a rise in the study and traditional use of medicinal plants around the world. Protective and disease-fighting phytochemicals are a diverse group of chemical compounds found in plants. Phyto-chemicals are naturally occurring plant chemicals that have a wide range of biological functions, including ant-malarial and antibacterial properties as well as anti-inflammatory and cancer-fighting properties (Tan *et al.,* 2010). The pharmaceutical, food, and cosmetic industries are becoming increasingly interested in exploiting curative and pungent plants as natural sources. Botanical medications, nutritional supplements, functional foods, and food packaging all use medicinal plants because of their bioactive components. Some of the phytochemicals in these plants have been shown in clinical trials to have therapeutic value in the treatment of various diseases such as cancer, heart disease, degenerative disorders, and HIV infection (Liu, 2003; Asres and Bucar, 2005). Flavonoids, anthraquinones, phenolic acids, and coumarin are just a few of the phenolic substances found in fruits, vegetables, herbs, and seeds (Young *et al.,* 2005). The study of natural products was once thought to have no bounds or boundaries, but in recent years, interest in this field has resurged and grown significantly, thanks in large part to advances in separation technologies, spectroscopy, and sophisticated bioassays. Throughout the years, there has been a growing body of data that naturally occurring chemicals from higher plants have the potential to be transformed into modern therapeutic medications.

Disinfectants, on the other hand, are antimicrobial compounds that are used to clean nonliving things. There are several antimicrobial agents in medicinal plants, and they are investigated for a variety of functions (Mahesh and Satish, 2008), such as antioxidants, insecticides, hypoglycemics, antipyretics, antihelmintics, analgesics, and antileishmanials (Doughari and Obidah, 2008). Bacterial infections are a major cause of death and illness around the world. Antibiotics are potent medications that either kill or inhibit the reproduction of germs, allowing the body's own defenses to quickly eradicate the infection. Medications used to treat bacterial infections may become less effective over time due to the target organisms' constant ability to adapt and evade the effects of medications (Arage *et al.,* 2022).

Modern medicine is resurrecting the quest for bioactive chemicals from plant-based medicines or creatures that can be used in the production of conventional pharmaceuticals. Taxol, morphine, quinine caffeine, atropine, and reserpine are all

examples of higher plant-derived medications that are now in use around the world (Shakya *et al.*, 2012). With our growing knowledge of the biological relevance and action mechanisms of active chemicals, it's clear that natural products will continue to be a significant source for new therapeutic medicines for a long time to come. The medicinal potential against many diseases like as cancer, diabetes, and cardiovascular disease has only been explored and screened for in a small percentage of tropical species up until now (Alsarhan, 2014). With a rise in drug resistance and side effects, there is a pressing need to find novel natural therapeutic treatments with targeted targets and minimal side effects. Unlike naturally occurring medications, synthetics have a quicker beginning of action and a greater number of negative effects (Shakya, 2016). The following are a few methods for discovering new drugs in nature: ethnobotany: indigenous and traditional medicine, ethnobotanical. Anthropometric and chemotaxonomic methods of relative screening are also available.

Methods Used For Extracting Data

In this review, we searched PubMed, Science Direct, Google Scholar, Scopus, Web of Sciences and a number of other databases for relevant material on the antiviral, antimicrobial, antibacterial, and antifungal properties of the Solanaceae family. Criteria for inclusion in this review; antimicrobials isolated from the plants of the Solanaceae, studies involving MIC and MBC concentrations or doses of extract prepared from members of the Solanaceae, studies of isolated active molecules and studies of mechanisms of action associated with their isolated active molecules from extracts. Solanaceae plants, antimicrobials isolated, antimicrobial activity, concentrations employed, and molecular mechanisms involved in the extraction of data were assessed for each of the retrieved papers. Antimicrobial potential has been discovered in the Solanaceae genera *Withania, Physalis, Solanum,* and *Datura*, according to the literature review. Based on their medicinal worth and antibacterial properties, these plants were chosen for this assessment because they are all members of the same family, can be found in one spot, and are commonly utilized in traditional health systems around the world.

Natural Products

Natural products produced by plants are numerous and diverse. Pesticides, pathogens, UVB damage, and other environmental pressures are all prevented by these molecules, which play a crucial role in the ecology of the planet. A large number of today's most popular medicines have their origins in plants, which are a rich source of new pharmacologically active chemicals. Many cultures throughout the world have relied on traditional healing methods that rely on natural materials since time immemorial. Despite the fact that herbal medicinal preparations containing bioactive natural products have been used for hundreds or even thousands of years, it was only in the 19th century that these chemicals were isolated and described for use in modern drug discovery and development (Veeresham, 2012). There are still many important natural lead compounds whose potential biological activity has not been investigated due to the fact that less than 10% of the world's biodiversity has been evaluated. The task now is to identify ways to access this natural chemical variety (Cragg and Newman, 2005). Despite fierce competition from compounds created by computational and combinatorial chemistry, natural products discovered up to this point have significantly improved human health and continue to be the preferred medications (Veeresham, 2012). Pharmaceuticals, agrochemicals, food and drink, and a wide range of other industrial biotechnology applications all make use of these microbes.

Natural Products from Plants

For thousands of years, plants have been documented for their therapeutic properties. Because of their long evolutionary history, they have developed distinct, structurally diversified secondary metabolisms that are resistant to bacteria, fungus as well as the elements. A key source of medicines for

early drug development was their ethno-pharmacological qualities (Mc Rae *et al.,* 2007). Eighty percent of the world's inhabitants still relies on conventional plant medicines for their key health care, as reported by the WHO. Natural compounds isolated from medicinal plants have become well-known pharmaceuticals thanks to knowledge gained through traditional medicine (complementary or alternative herbal products) and research into medicinal plants (Dias *et al.,* 2012).

Many benefits have resulted from the research of natural products. It has contributed to the expansion of partition science and technology, spectroscopic methods of structure clarification, and synthesis procedures that currently form the fundamentals of analytical organic chemistry (Kinghorn *et al.,* 2011). The primary source of information on medicinal plant applications is derived through human experimentation over hundreds of years in pursuit of readily available foods for the treatment of disease, whether through taste tests or untimely deaths (Kinghorn *et al.,* 2011). One of the most important groups of plants is the flora known as medicinal plants. It's common to refer to medicinal plants as those that have therapeutic or medicinal properties. They contain and create a variety of chemicals that have an effect on human health. It also provides the country with an important source of foreign currency. Nearly a fifth of the market is accounted for by Ayurveda and Unani, the two systems of herbal treatments (Ramasamy and Charles Manoharan, 2004).

Traditional medicine has played a critical influence in the discovery of powerful substances. For example, the discovery of antimalarials like cinchona tree alkaloids, pain relievers like morphine alkaloids, and aspirin can be considered early successes in the production of pharmaceuticals from natural materials. Antimalarial drug Quinine was first discovered in the bark of *Cinchona trees, Cinchona succirubra*. Between 1803 and 1806, the *Papaver somniferum*'s primary alkaloid, morphine, was first isolated. The Egyptian medicinal record, the Ebers papyrus, suggests that willow leaves were used as an antipyretic (Viktorin and Sartorius, 1999). It was Merck and Bayer who developed the first commercially available natural substance for medicinal use, morphine, in 1826; and it was Bayer who introduced the first semi synthetic pure medication, aspirin, in 1899 (Veeresham, 2012). Salicin was the first compound to be isolated as a result of this research. Afterwards, it was hydrolyzed and oxidized to produce salicylic acid, which proved effective as an antipyretic and was manufactured and used worldwide. The most commonly prescribed analgesic and antipyretic medication in the world is aspirin (Tesso, 2005). The natural products doxorubin, paclitaxel, cyclosporine A, tacrolimus, and lovastatin are all well-known and commonly used medications for their effects as anticancer and immunosuppressive agents. There is little doubt that natural products are key sources of novel therapeutic agents, and they have played a major role as lead compounds in drug development projects (Taha, 2011). Tiotropium a derivative of atropine from *Atropa belladonna* in chronic obstructive pulmonary disease, and Cannabidiol obtained from *Cannabis sativa* and Capsaicin from *Capsicum annuum* are used as pain relievers (Veeresham, 2012).

Family Solanaceae

It is estimated that there are around 2,700 species in the Solanaceae family, dispersed among 98 genera (Olmstead and Bohs, 2006). However, the origins of the Latin word Solanum, which means "nightshade plant," remains a mystery; it has been hypothesised that the Latin verb solari, which means "to soothe," is the source of the family's name. Some of the family's psychotropic species are thought to have calming effects on the body and mind. Almost 300 distinct alkaloids can be found in this family alone (Friedman and McDonald, 1997). The major members of this family are solanine, scopolamine, atropine, and hyoscyamine (Stanker *et al.,* 1994). Ethnobotany is a branch of horticulture that includes herbs, shrubs, and trees, all of which are utilized widely by humans as a food, spice, and medicine source (Das *et al.,* 2016). A significant part of the

Solanaceae family is that it includes both therapeutic and commercial plants. The Solanaceae family includes some of the world's most valuable commercial crops, including potatoes, eggplant, tomatoes, and peppers. Solanum, the biggest genus in the Solanaceae family, is found across temperate regions of the planet, from desert to the wettest tropical rain forests and are morphologically diverse, with an incredible range of characteristics of both the flowers and fruits (Knapp *et al.,* 2004).

Solanaceae is one of the most significant angiosperm groups to humans. In addition to being utilized for food and medicinal purposes, *Solanum tuberosum*, *Solanum lycopersicum*, *Solanum* melongena, and *Nicotiana tabacum* are all members of the Solanum genus, which also includes *Atropa belladonna*, *Mandragora officinarum*, and *Duboisia* sp. Toxic chemicals and secondary compounds in pharmaceutical substances and their use in the pharmaceutical industry make many other species suitable for human ingestion as food (Eskandari *et al.,* 2019). Antioxidant molecules in tomatoes are largely responsible for the fruit's beneficial benefits on human nutrition, which is why tomatoes are so widely consumed around the world. Carotenoids and anthocyanins, two health-promoting chemicals found in tomato fruits, have been improved by metabolic engineering or breeding (Rigano *et al.,* 2013). A wide range of morphological and ecological variations, as well as a remarkable amount of variation in flower and fruit morphology, characterise members of the Solanaceae family, which includes anything from trees to small annual herbs (Knapp *et al.,* 2004). There are a range of chemicals that are produced by all plants that serve as natural defences against diseases like fungi, viruses and bacteria, insects and worms; this review was conducted by Fridman (2004).

To date, researchers have identified 12 alkaloids, 35 withanolides, and seven sitoindosides in *Withania somnifera*. Withaferin A, D, and G have been identified as the primary withanolides responsible for the majority of the plant's therapeutic effects (Verma and Kumar, 2011). The whole alkaloid pattern is of importance not only in terms of phytochemistry, but also in terms of characteristics of alkaloid biosynthesis and metabolic processes (Bazaoui *et al.,* 2011). *S. laciniatum* contains solasodine, as do several other Solanum species including those listed above. An alkaloid sapogenin with a nitrogen atom, spiroketal alkaloid solasodine, is utilized in the medical business to produce steroid drugs. It's also been found to have antioxidant, anticancer, insecticidal, anti-accelerator, and cardiac properties, all of which are useful in the manufacture of contraceptive drugs (Thongchall *et al.,* 2010). They contain various alkaloids, some of which are used in many traditional medical systems, such as Ayurveda and Siddha, TCM, Unani, and homoeopathy (Chowanski *et al.,* 2016). Furthermore, the genus Solanum's propensity to synthesise steroidal alkaloids, many of which are of therapeutic significance, makes it an economically important plant (Torres *et al.,* 2013). Since ancient times, *Withania somnifera* has been employed in Ayurveda, Siddha, and Unani medicine, as well as in indigenous medicine. It has also received a lot of modern scientific attention because of its wide range of therapeutic applications. The antibacterial activity of the plant and its metabolites has gained attention because of the issue of developing antibiotic-resistant infections (Bisht and Rawat, 2014).

Antimicrobials from members of family Solanaceae

Kasa *et al.,* (2012) have also investigated the antibacterial properties of ethanolic and methanolic extracts of the whole plant of *Solanum nigrum*. A number of Solanaceae species were studied by Almoulah (2017) for their antibacterial, phytochemical, and biological properties, the results showed that the Solanaceae plants could be an excellent natural source of chemotherapeutics.

A study by Abbas *et al.,* (2014) found that fruit extracts of *S. nigrum* and *S. xanthocarpum* have antimicrobial properties, and he found that the fruit extracts had a high percentage of water-soluble components and only a little amount of petroleum

ether-soluble components. Djaafar and Ridha (2014) conducted a phytochemical examination of the therapeutic herb *Solanum nigrum* in the Algerian desert.

Evolutions of in-vitro Antibacterial activity of *Physalis minima* L. studied by Nathiya and Dorcus (2012), He tested the antibacterial activity of *Physalis minima* L. against nine pathogens in its plant parts, the leaf and stem extracts of all solvents invariably showed reasonable anti-bacterial activity, and high levels of phytochemical content were found in leaf extracts, ethanolic extract was found to be more effectual than the other solvents used in the experiment. Thin-layer chromatography and FTIR/GC-MS analysis were used to discover the functional groups in the phytochemical and antibacterial activity of fruits extract of *Physalis minima* fruit extracts by Pradeepkumar *et al.*, (2022). Ahmed *et al.*, (2022) also investigated the in vitro anthelmintic activity of *Physalis minima* leaves and stem extracts; they found that crude extracts had the best anthelmintic activity, whereas ethanolic *P. minima* leaves and stem extracts inhibited fatworm spontaneous movement in a dose-dependent manner. Among the pathogens studied by Vadlapudi and Kaladhar (2012) for their antimicrobial activity, they found that plant extracts from aerial parts of *Datura metel* L. showed significant growth inhibition in both *Erwinia caratovara* and *Pseudomonas*, while the lowest activity was found in *A. strictum* when using methanolic extracts.

Phytochemical and antibacterial activity of *Datura metel* L. have been studied by Krishnan *et al.*, (2017), who found that the ethanol extract is the most effective against the pathogens tested. Currently, Arage *et al.*, (2022) has been examined evaluation of antibacterial activity of three species of Solanaceae family namly, *Artemisia absinthium*, *Datura stramonium* and *Solanum anguivi*. One of the bacteria tested, *Salmonella enterica* serovar Typhimurium, was found to be most vulnerable to the extract's 80 percent methanol concentration, suggesting that it could be used as an antibacterial agent in the future.

Many members of the Solanaceae family are well-known for their wide variety of alkaloids. Scopolamine, Atropine, and hyoscyamine are all examples of bicyclic molecules in these substances. This is one of the most effective anticholinergics in existence, which means that it blocks the signalling of acetylcholine, an endogenous neurotransmitter. Mouth dryness, dilated pupils, retention of the urine, hallucinations, convulsions, coma and death are all signs of overdose (Ansari, 2005). *Solanum*, *Datura*, *Withania*, and *Physalis minima* are four Solanaceae wild medicinal herbs. The Braj region, which includes Agra and Mathura in western Uttar Pradesh, is home to an abundance of these four wild medicinal herbs. Traditional and Ayurvedic medicine is based on the medicinal properties of these species because they contain antibacterial compounds that may be extracted from their leaves, fruits, and stems. As a result, these plants were chosen for the current investigation.

Solanum nigrum L.

Solanum nigrum the nightshade is one of the largest and most diverse genus of the family Solanaceae (Fig. 1). Because of its extreme diversity, it is not only intriguing from a taxonomic standpoint, but it is also beneficial to humankind. Forbs, vines, and sub-shrubs are all examples of these plants. Fruit and flower-bearing shrubs and tiny trees are common. Around 1,500-2,000 species presently make to the genus. Since ancient times, representatives of this genus have been utilized medicinally. Even though the green and unripe parts of these plants are poisonous to humans, several species in the genus do have edible parts such the fruits, leaves, or tubers of the plants that grow inside. Plant known as Black Nightshade, *Solanum nigrum* L. is a dicot weed. African paediatrics plants are used to treat a variety of diseases, including feverish convulsions, which are a leading cause of newborn mortality (Bhat *et al.*, 2008). *S. nigrum* has been reported to be helpful for panic attacks, heart palpitations, and nausea caused by overheating. The use of nightshade in the treatment of burns and ulcers is widespread among Arabs. In addition to

these qualities, *S. nigrum* L. has also been found to be antiseptic, antiinflammatory, and antidysenteric. *S. nigrum* herbal extract has been linked to antitumor and anticancer activities in recent studies. Solamargine, solasonine, and b solanigrinechez have been found in the berries of *S. nigrum* in recent investigations (Ravi *et al.*, 2009). As a source of one of the most widely used plant poisons, *S. nigrum* has also proven to be a reservoir of phytochemicals with potential for therapeutic application. For the treatment of gastritis, stomach ulcers, and other gastrointestinal issues, the leaves and berries of *S. nigrum* are frequently utilized in South India (Hameed *et al.*, 2017).

Datura metel

Datura is a genus of vespertine flowering plants which belongs to the family Solanaceae (Fig. 2). *Datura metel* is a blooming medicinal herb that can reach a height of three feet. *D. metel's* leaves measure between 10 and 20 cm long and 5 to 18 cm wide. Short, silky grey hairs cover the leaves. It can be found in tropical and subtropical regions of the world, including Asia, England, and Africa. We don't yet know where it will be naturally distributed. *Datura fastuosa* is the most toxic of all the Datura species, although it is not the only one. Hyoscyamine, atropine, and scopolamine are the active alkaloids in this plant (Kokate *et al.*, 2008).

The *Datura metel* is a medicinal herb with great promise, there is an increase in scopolamine and atropine concentrations throughout the plant as it matures, with the concentrations being highest at the conclusion of the plant's reproductive stage. The alkaloids hyocyanine, hyoscine, and atropine are also found in plants.

Atropine makes up the majority of the leaves' 0.426 percent alkaloid content. Extracts of the alcoholic extracts of *D. metel* leaves have yielded the colorless crystallised ingredient daturilin; these chemicals were identified as withametelin C, D and E (Gufta *et al.*, 1992). *D. metel* propagated shoots were found to contain C28 sterol 3beta, 24 upsilon-dihydroxyergosta-5-25-dienol, and the withanolide 12-deoxywithastramonol (Bratati De, 2003). As far back as 3000 years, *Datura metel* has been used as a medicinal plant. Anodyne, sedative, antitussive and bronchodilator are some of the uses of propane alkaloids in this herb.

Epilepsy, hysteria and hysteria, insanity, heart illness, fever with catarrh, diarrhoea and skin problems can all be treated with it. In order to combat the high prevalence of viral pathogens in our nation and to provide a new source of antibacterial medication to replace pricey, chemically-produced antibacterial medications that might be hazardous to humans, it was decided to conduct a phytoconstituents and antibacterial assessment of *Datura metel* fruit extract (Lim *et al.*, 2020).

To cure asthma, convulsions, pain, rheumatism and hypolipidemic characteristics of *Datura metel* is a traditional application (Kayode *et al.*, 2016). Polyphenols, alkaloids, glycosides, triterpenoids and flavonoids abound in this plant's pharmacological makeup (Jakabov *et al.*, 2012). Datura species seeds and leaves contain alkaloids, including scopolamine, atropine, and hyoscyamine (Berkov *et al.*, 2006). *Dracaena metel* is mostly used as an intoxication and psychedelic, but it also contains a wide range of phytoconstituencies such as soya bean extract and flavonoid compounds (Donatus and Ephraim, 2009).

Withania somnifera

Withania somnifera is a small evergreen shrub that can naturally reach a height of one metre (Fig. 3). Simple, hairless, and green leaves measure about 5-8 centimetres in length. The stem is thick, woody, and silver-green in appearance. Heavily-textured, lengthy tuberous roots are meaty and brownish-white (Singh *et al.*, 2021). These genera are home to roughly twenty different species. From a medical standpoint, *W. somnifera*, *W. coagulans*, and *W. simonii* are particularly important. As a significant element in Ayurvedic and Unani dishes, they are gaining popularity.

Fig.1 Plant of *Solanum nigrum* L.

Taxonomic Position:	Vaenacular Name:	
Kingdom: Plantae **Phylum:** Tracheophyta **Class:** Magnoliopsida **Order:** Solanales **Family:** Solanaceae **Genus:** *Solanum* **Species:** *nigrum* L.	**Hindi:** Mokoi **Malayalam:** Mulaku-thakkali **Telugu:** Kasaka **Kannada:** Kaaki, Ganike **Urdu:** Makoya **Marathi:** Laghukavali **Common name:** Black nightshade	

Fig.2 Plant of *Datura metel*

Taxonomic Position:	Varnacular Name:	
Kingdome: Plantae **Subkingdome:** Tracheobionta **Superdivision:** Spermatophyta **Division:** Magnoliophyta **Class:** Magnoliopsida **Order:** Solanales **Family:** Solanaceae **Genus:***Datura* **Species:***metel* L.	**Hindi:** Safed Dhatura **English:** Thorn apple **Sanskrit:** Datura: **Manipuri:** Sagolhidak **Tamil:** Umattai, Umattai **Kannada:** Kari ummatti **Common name:** Devil's Trumpet	

Fig.3 Plant of *Withania somnifera*

Taxonomic Position: **Kingdome:** Plante **Division:** Tracheophyta **Subdivision:** Spermetophyta **Class:** Magnoliopsida **Order:** Solanales **Family:** Solanaceae **Genus**: *Withania* **Species:** *somnifera* L	**Varnacularname:** **Marathi:** Kanchuki, Askandha **Sanskrit:** Ashvagandha **Bengali:** Ashvagandh **Punjabi:** Asgand **Tamil:** Asuragandi **Urdu:** Asgandanagaori **Gujarati:** Aksand, asvagandha **Common name:** Ashwgandha and Winter Cherry	

Fig.4 Plant of *Physalis minima*

Taxonomic Position: **Kingdome:** Plantae **Phylum:** Tracheophyta **Class:** Magnoliopsida **Order:** Solanales **Family:** Solanaceae **Genus:***Physalis* **Species:***minima* L.	**Varnacular Name:** **Hindi:** Rasbhari **English:** Sunberry **Sanskrit:** Charapotta, Tankari **Kannada:** Gudde hannu **Marathi:** Chirambot **Tamil:** Notinotta **Common name:** Ground Cherry	

Traditional medicine and Ayurveda, Siddha and Unani systems of medicine have employed *Withania somnifera* for thousands of years since it is a significant medicinal plant. It has also received a lot of modern scientific attention because of its wide range of therapeutic applications. The antibacterial activity of the plant and its metabolites has gained attention because of the issue of developing antibiotic-resistant infections (Bisht and Rawat, 2014).

Ashwagandha, or *W. somnifera*, is one of the most commonly used tranquillizers. Somnifera, the scientific name for this plant, literally translates to "causing sleep," implying that it has sedative characteristics. However, it has also been used to boost sexual vitality and as an adaptogenic herb (Krutika, *et al.*, 2016). Aphrodisiac, diuretic, and memory enhancer are just a few of the traditional Ayurvedic applications. It has a rejuvenating impact on the body, primarily on the reproductive and nervous systems, and is used to boost energy and speed recovery from chronic sickness. The seeds and fruits used in traditional Indian medicine to treat a variety of ailments such as liver tonic, aphrodisiac, astringent, and antiinflammatory as well as senility, pulmonary disease, ulcerative colitis, asthenia, and sleeplessness, among other things (Verma and Kumar, 2011). Medications derived from the plant's leaves and roots are used to treat inflammation of the tubercular glands and skin illnesses, anti-cancer, bronchitis and ulcers. Antibiotic, aphrodisiac, diuretic, narcotic, extremely sedative, and tonic properties are found in the leaves and root bark of the plant. Withanine is the primary ingredient of the different alkaloids. Anhydrine and anaferine are more alkaloids to be aware of. Other alkaloids include somniferin and its metabolites: somniferin and somniferinine. Stigmasterol, stigmasterolglucoside, viscosa lactone B, and + glucose have been discovered for the first time in Ashwagandha roots (Mishra, 2008).

This herb is also regarded as the "Prince of Herbs" in Ayurveda because of its wide variety of medicinal properties and possible health benefits. Biochemical activity and excellent therapeutic characteristics of *W. somnifera* root have been utilized in the Indian systems of Ayurveda and Sidhha and Unani medicine since ancient times to treat ulcers, bronchitis; asthma; emaciation; leukoderma; diarrhoea; liver illness; and insomnia by the local population. Ayurveda, a holistic system of treatment that originated in India, uses Ashwagandha root as one of its most important components (Singh *et al.*, 2021). This recommended Ayurvedic botanical is known as an antiviral, immunomodulatory, anti-inflammatory, and adaptogenic agent and may have beneficial effects on comorbidities associated with COVID-19. Ayurvedic medicines made from Ashwagandha plant may be effective in the management of COVID-19 (Saggam *et al.*, 2021).

Physalis minima

Plants of the Solanaceae family, the *Physalis minima* are annuals that grow between 20 and 50 centimeters in height. Soft, smooth (not hairy) leaves measure 2.5-12 cm long and have unbroken or serrated edges. White to off-white flowers. There is an appealing cherry tomato-like taste to this fruit when it's fully mature. One of the most common plants in tropical regions is *Physalis minima*, a native of the Americas. Because it can grow in the mountains, you'll have no trouble finding it (Fatmawati, 2019). Small, yellow blooms adorn this plant, which bears round fruit that is greenish-yellow before it ripens to an old brown colour and has a sweet-and-sour flavour. A fruit wrapping veil keeps the fruit's interior safe. A single stemmed leaf with an oval, elongated, lanceolate, and pointed tip, as well as an unequal tip and a blunt, pointy, flat, or wavy edge is the most common. The Indian System of Medicine uses *Physalis minima* as a key medicinal herb. Laxative, diuretic, and anti-inflammatory properties have been described for *P.minima*. However, the plant's antibacterial properties have not been thoroughly studied. The presence of alkaloids and phenolics in the plant suggests that it could be an effective anti-infective agent in the future (Patel *et al.*, 2011). Antifertility, hypoglycemic, antiulices, antibacterial, analgesic, antipyretic and alpha glycosidase inhibitor activity

have been reported in *Physalis minima* (Angamuthu *et al.,* 2014). As phenolics and alkaloids are the plant's main chemical elements, they imply that the plant could be an effective anti-infective agent and is also claimed to have diuretic properties (Patel *et al.,* 2011).

Concluding remarks

The antibacterial potential of plants in the Solanaceae family has been outlined in this review, which links ethnobotanical usage with antimicrobial action. Solanaceae plants produce a variety of antimicrobial phytimolecules, including defensin, a protease inhibitor, lectin, thionin-like peptide, vicilin-like peptide and others, as revealed by these findings. The genera *Solanum*, *Datura*, *Withania*, and *Physalis* appear to be the most promising sources of antibacterial phtomolecules. Solanaceae phytomolecules methods of action, on the other hand, weren't very novel; they were more in line with those of other widely used antimicrobials. Phytomolecules from the Solanaceae family have been discovered and identified as part of the plant's defensive system. This means that their ethnobotanical virtues, such as antibacterial and toxic, are strongly linked to their ethnobotanical properties. Phytomolecules in the Solanaceae family have been shown to have promising antibacterial action, which could lead to new antimicrobial medication development. Solanaceae phytomolecules can be a valuable resource for the development of new ways to agricultural plant protection in addition to their therapeutic applications. Additionally, new Solanaceae species may hold promise as potential sources of novel antimicrobials. For future studies in teaching and establishing medicinal importance, this database electronic review on four plants of the Solanaceae family (*Solanum nigrum*, *datura metel*, *Withania somnifera* and *Physalis minima*) will provide knowledgeful information about the antimicrobial activity and ethno-medicinal importance of selected plant species.

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