

TRIBAL PLANTS AND THEIR INBORN ANTIMICROBIAL ACTIVITIES

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ABSTRACT

The importance of medicinal plants in traditional health-care practices provides clues to new areas of research and in the biodiversity of conservation. Right from the beginning, the documentation of traditional knowledge, especially on the medicinal uses of plants, has provided many important drugs for the modern day. Even today, this area holds much more hidden treasure as almost 80% of the human population in developing countries depend on plant resources for health care. Keeping this in view, the present study was initiated to document the traditionally used tribal plants and their inborn antimicrobial activity which is enhanced on the synthesis of noble metal nanoparticles.

Keywords: Nanoparticles, Tribal plants, Antimicrobial activity.

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INTRODUCTION

About 5000 years ago, several countries used silver to store food products. Greeks and Romans stored water in silver vessels. In the 1800s, silver was used in various application fields such as drinking, storing the food products, and cosmetics. It was even used in the treatment of ulcer. In the 1880s, silver nitrate drops were used as antibiotic drops for newborn babies [1]. In the 1920s, silver was used to manage wounds. Silver ions have the capacity to act against microbes. This is one of the major reasons why the royals used silver utensils. In the Hindu religion, till date, silver utensils are preferred for the "panchamrita" preparation using curd, *Ocimum sanctum*, and other ingredients [2].

Combining the ever significant silver with the flourishing nanotechnology has given tremendous results in the field of tissue engineering, drug delivery, food industries, and pharmaceutical industries. Among various metals, silver nanoparticles (AgNPs) are of particular interest due to their noteworthy antimicrobial and their localized surface plasmon properties which renders them in having broad-spectrum in antimicrobial [3,4] activity, surface enhanced Raman spectroscopy [5], chemical/biological sensors and Biopharma materials [6,7], biomarker [8-9], and so on.

AgNPs are ranged from 1 to 100 nm in size naturally. They have exceptional optical, thermal, and electrical properties. They are incorporated into industrial applications. Recent trend demands for the thick-printed, electronic circuits due to the space between these circuits [12-14]. Therefore, the synthesis of AgNPs becomes an important issue in this industry. The synthesis of noble metal nanoparticles can be carried out by three major methods which are physical, chemical, and biological methods. AgNPs have been synthesized by physicochemical techniques such as chemical reduction [14], gamma ray radiation [15], microemulsion [16], electrochemical method [17], laser ablation [18], autoclave [19], microwave [20], and photochemical reduction [21]. The effective yield method is associated with the limitations such as use of toxic chemicals, higher operational cost, and energy needs. Considering the drawbacks of physicochemical methods, cost-effective and energy efficient new alternative for AgNP synthesis using microorganisms [22], plant extracts [23], and natural polymers [24] as reducing and capping agents are emerging very fast [25].

Traditional herbal medicines (THMs) in the last one decade have gained importance in various developed countries. THM is practiced in several

parts of the world, especially in Africa, Bangladesh, China, Europe, West side of America, Russia, Pacific Islands where large ethnic community still lives on. History has revealed that most of the people in the world have been using plants, animals, microorganisms, and minerals in treating their illness [26]. One-third of the adults from America, 74% population of the United Kingdom, and about 60% of population from the Netherlands and Belgium are now utilizing alternative herbal therapies (WHO, 1996).

India is blessed with a rich and diverse heritage of cultural traditions. These traditions are associated with the usage of wild plants as medicinal herbs. The use of medicinal herbs is still a tradition adopted by ethnic communities who are living in undulating plains and at the foothills of dense forest. Shanker (1998) has reported about traditional folk healers in India [27].

The Central part of India comprises states such as Chhattisgarh, Maharashtra, Odisha, Jharkhand, and Madhya Pradesh. The people of this region are ethnically called as Bhil, Gond, Hill Korwa, Baiga, Bhariya, Birhor, and Sahariyas. They use a wide range of wild tribal plants for their health care. Green synthesis of AgNPs using tribal plants, such as *Lawsonia inermis*, *Vitex negundo*, *Artemisia nilagirica*, *Crataegus douglasii*, *Ziziphus mauritiana*, *Mucuna pruriens*, *Coleus amboinicus*, and *Datura metel* can result in biologically and cytologically compatible metallic nanoparticles [28].

TRIBAL PLANTS

***Coleus amboinicus* Lour**Botanical name: *Labiatae*Family: *Lamiaceae*Species: *C. amboinicus*

C. amboinicus Lour, it is under the kingdom - Plantae, family - Lamiaceae, and the species is amboinicus. The leaves are thick and have a length of 1-2" [29]. It is a small plant with a stem height of 1-2 ft. It has some hairs on it. Flowers are blue and purple in color.

It flowers in early summers. For its essential oil, it has been cultivated in the Far East. Before the end of the 19th century, the plant was scattered in Caribbean and from northern Venezuela to Yucatan. This plant contains monoterpenoid, luteolin, and flavonoids. It has been used in the treatment of cough, chronic asthma, fever, and bronchitis [30].

The parts of the plant were used for medicinal purposes, such as juice for indigestion, cholera, gastrointestinal, and diarrhea. The leaves of *C. amboinicus* contain phenolic compounds such as carvacrol, flavonoid, rosmarinic, caffeic acid, and chlorogenic acid. Powdered leaf is used for aches, paralysis, cough, cold, and asthma, and in best condition, it is applied to insect bites and headaches [31]. The flavonoid contents of this plant include Flavonoid: salvigenin, 6-methoxygenkwanin, quercetin, chrysoeriol, luteolin, apigenin, Flavanoid: eriodictyo, and flavanol taxifolin, thus making it efficient against *Pseudomonas aeruginosa*, *Bacillus subtilis*, *Escherichia coli*, *Staphylococcus aureus*, *Trichophyton mentagrophytes*, and *Aspergillus niger* [32]. Essential oil of this plant is effective against fungi and bacteria while hydroalcoholic extract of this plant is active against methicillin-resistant *S. aureus* [33].

Datura metel

Botanical name: *Datura stramonium*

Family: Solanaceae

Species: *D. metel*

D. metel is a shrub-like perennial herb plant and is called as devils trumpet [34]. The common name for this plant is thorn apple and the Tamil name is Ummattangani/Vella-Ummathai [35]. The plant can grow up to 3 ft. It has dark violet shoots and oval leaves. The colors are yellow, red, and cream. The seeds are numerous with conical humps and a few spines [36]. The biomolecules present in the plant are scopolamine, vitamin, hyoscyne, fastusic acid, etc. It has been used mainly in pharmaceutical industries for ointment, hair growth, asthma, cough, etc [37].

It has a wide range of applications in India, including in the treatment of many diseases such as epilepsy and few mental health issues such as hysteria and insanity. It has also been used for heart diseases, fever with catarrh, diarrhea, skin diseases, etc [39]. In China, the plant is used in the treatment of asthma [40]. In Vietnam, the dried flowers and leaves are cut into small chips and are used in antiasthmatic cigarettes [41]. The whole plant, especially the leaves and seed, has significant properties for anesthetic. It can also be used for anodyne, antiasthmatic, antispasmodic, and antitussive. It has also been used for bronchodilator, hallucinogenic, hypnotic, and mydriatic [38].

Great caution is advised on the usage of this plant since excess doses cause hallucinations. It even leads to death on severe intoxication. This plant should only be used under the guidance of a qualified practitioner as its toxic dose is very close to medicinal does [42]. The plant contains the alkaloids such as hyoscyamine, hyoscyne, and atropine. Atropine dilates the pupils. It is also used in eye surgery [43]. The total alkaloid content of the leaves is 0.426%, which is mainly atropine. The seeds contain 0.426% alkaloids, which is mainly hyoscyamine. The roots contain 0.35% hyoscyamine. An extract of 3 g of the flowers is used as an anesthetic which can last up to 5-6 hrs [44]. The growing datura plant acts as an insect repellent. The juice of datura plant is applied over the scalp to treat hair fall, hair loss, and dandruff [45]. The presence of alkaloids such as scopolamine, hyoscyamine, and atropine makes datura poisonous [46].

Artemisia nilagirica

Botanical name: *Artemisia nilagirica*

Family: Asteraceae

It is a tribal plant which is widely present in India. It is mostly found throughout the hilly regions such as Kashi, Sikkim, Kerala, and other places [47]. The parts of this plant can be used for many applications. Oil possesses antifungal, antimicrobial, insecticidal, and larvicidal activity since it contains compounds such as camphor, 1,8-cineole, eudesmol, artemisia alcohol, gurjunene, para-cymene, terpinene-4-ol, and pinene [48]. The oil from the seed is used for effectiveness of skin and to kill the head lice. The seed extract is used to treat heart failures and it is one of the best drugs in pharmaceutical industries [49]. The bark is used externally for all skin troubles, and it is used to treat

diarrhea, piles, and urinary problems. The fresh juice of bark is good to treat diarrhea [50].

Conventionally, it is used in the management of epilepsy, nervous disorders, as diuretic, anti-inflammatory, and skin disorders [51], but recently, it was found to possess pharmaceutical properties. These evidences prove that the whole plant is of great therapeutic value.

The future prospect includes preclinical studies on the aerial parts as well as root [34]. Extracts of *A. nilagirica* showed the broad spectrum of antibacterial activity on the tested microorganisms. Hexane extract exhibited high inhibitory potency against phytopathogens and methanol extract showed maximum inhibition against clinical pathogens except *S. aureus*, *Enterococcus faecalis*, and *Klebsiella pneumonia* [52]. The phytochemical analysis showed the presence of effective biological compounds such as alkaloids, amino acids, flavonoids, phenols, tannins, and terpenoids. These derivatives could be potential alternatives to the traditional chemical control of clinical pathogen and phytopathogenic bacteria as shown in Table 1 [53].

Lawsonia inermis

Botanical name: *Lawsonia inermis*

Family: Lythraceae

Species: *L. inermis*

L. inermis is a tribal plant, which is widely present in India. This species is globally distributed in the Paleotropics [54]. It is cultivated within India for its leaves throughout and as a hedge-plant in Punjab and Gujarat. To a small extent, it is cultivated in Madhya Pradesh and Rajasthan [55]. Important centers of production include Faridabad (Punjab), Bardoli, and Madhi (Gujarat) [56].

The common name of this plant is Henna. *L. inermis* is a small shrub plant which has bioactive compounds such as lawsone, fraxetin, gallic acid, coumarins, resins, and tannin. Among these compounds is the major ingredient which gives its characteristic color [57]. This plant has been used in pharmaceutical industries since ancient times. The leaves are used to treat as lumbago, diarrhea, bronchitis, wounds, rheumatism, fever, and falling of hair [58].

The phytochemical compounds present in the juice are 1,4-naphthoquinone, 2-hydroxy-1,4-naphthoquinone, β -sitosterol, esculetin, cosmoisin, laloiside, quinone, scopoletin, tilianin. These compounds help in the treatment of diabetes, skin diseases, hemorrhage, and fungal infections [59].

In Western and the Middle East, henna is used in hair dyes, shampoo, and conditioners [60]. Extracts of henna are also used to stain wood and to dye fabric and textiles. It is also known as good medicinal plant which has properties of astringent, antihemorrhagic, intestinal anti-neoplastic and sedative effects [61].

Henna extracts have antibacterial and antifungal properties while the aromatic flowers are used for making of perfumes [62]. Conventionally, henna is used to create beautiful designs on hands and other body parts of body on various occasions such as weddings and festivals. Applying henna on the wedding and festivals is considered auspicious [63].

Vitex negundo

Botanical name: *Vitex negundo* Linn.

Family: Verbenaceae (Nirgundi Kula)

Species: *V. negundo*

V. negundo Linn. (Verbenaceae) is a woody, aromatic shrub growing to a small tree. It grows in humid places or along water courses in wastelands and also in mixed open forests [64]. It has been reported to occur in Afghanistan, India, Pakistan, Sri Lanka, Thailand, Malaysia, Eastern Africa, and Madagascar. It is grown commercially as a crop in parts of Asia, Europe, North America, and the West Indies [65].

Table 1: Efficacy of AgNPs when synthesized using the essential parts of tribal plants

S. No.	Name of the plant	Parts used	Authors	Operating conditions	Characterization	Size	Inference
1	<i>Coleus amboincicus lour</i>	Leaves	Vadivel et al.	1 mM, 50 ml/50 ml, 80, 1 hr	UV-Vis, FTIR, EDAX	25.83-0.78 nm (fcc)	FRAP reduction by extract is 350 µmoles/mg
2	<i>Datura metel</i>	Leaves	Murugan et al.	1 mM, 10 ml/90 ml, 30, 10 minute	UV-Vis, FTIR, EDAX	Irregular shapes and size of 40-60 nm 50-350 nm; spherical, triangular	Showed efficient results against larvae of <i>Anopheles stephensi</i> Antimicrobial activity against <i>Escherichia coli</i> and <i>Vibrio cholera</i>
3	<i>Artemisia uilagirican</i>	Leaves	Mittal et al.	1 mM, 10 ml/90 ml, 30, 45 minute	UV-Vis, FTIR, SEM, XRD		
4	<i>Lawsonia inermis</i>	Leaves	Kumar et al.	1 mM, 10 ml/90 ml, 80, 25 minute	UV-Vis, SEM, EDAX, XRD, ZETA potential	13-61 nm, conductivity value is about 0.439 mS/cm, spherical, fcc	Antibacterial activity against beta-haemolytic <i>Streptococcus</i> sp., <i>Bacillus</i> sp.
5	<i>Vitex negundo</i>	Leaves	Kathireswar et al.	1 mM, 10 ml/90 ml, 80, 15 minute	UV-Vis, FTIR, SEM, XRD	60 nm, spherical, fcc	Antimicrobial action against <i>Escherichia coli</i> , <i>Staphylococcus aureus</i> , <i>Pseudomonas</i> sp., <i>Proteus vulgaris</i> , and <i>Salmonella typhi</i> .
6	<i>Zizyphus mauritiana</i>	Leaves	Sadeghi et al.	1 mM, 10 ml/90 ml, 30, 20 minute	UV-Vis, FTIR, SEM, XRD	15-35 nm, fcc spherical	Antibacterial Action against Gram-positive (<i>Staphylococcus aureus</i>)
7	<i>Mucuna pruriens</i>	Seed	Arul Kumar et al.	1 mM, 10 ml/90 ml, 30, 1 hr	UV-Vis, FTIR, TEM, XRD	10-27 nm, oval, spherical, triangle, and circular. fcc structure	AgNPs is used for biomedical and pharmaceutical applications

FTIR: Fourier transforms infrared, EDAX: Energy dispersive X-ray, UV-Vis: Ultraviolet-visible, SEM: Scanning electron microscopy, XRD: X-ray diffractometry, AgNPs: Silver nanoparticles, fcc: Face-centered cubic, FRAP: Ferric reducing antioxidant power, TEM: Transmission electron microscopy

V. negundo also finds use as a food crop (Facciola, 1990) and as a source of timber. Vitex plant grows up to 10 ft. The origin of the plant is India and is easily cultivated cause of its eco-friendly nature. It is cost-effective. It commonly bears tri- or penta-foliolate leaves on quadrangular branches, which gives rise to bluish-purple colored flowers in branched tomentose cymes [66].

In the USA, purple flowers bloom during summer which is popularly visited bees and butterflies.

The juice from leaves contains casticin, isoorientin, chrysophanol D, luteolin, p-hydroxybenzoic acid, and D-fructose [67] while the main constituents of the oil are sabinene, linalool, terpinen-4-ol, β-caryophyllene, α-guaiene, and globulol, which constitutes 61.8% of the oil. *In vitro* and animal studies have shown that chemicals isolated from the plant have potential anti-inflammatory, antibacterial, and antifungal activities [68].

V. negundo is also used for treating stored garlic against pests and as a cough remedy in the Philippines [69] while the roots and leaves are used in eczema, ringworm and other skin diseases such as liver disorders, spleen enlargement, rheumatic pain, gout, abscess, and backache. Seeds are used as vermicide. It is also used to control population of mosquitoes [70]. Herbal medicine, rather than merely curing a particular disease, aims at returning the body back to its natural state of health [71]. The phytochemical components of plants act either individually, collectively, or synergistically for the improvement of health [72].

After analyzing the different chemical components present in the plant, it is important that focus shifts to the medicinal applications of the plant. Myriad medicinal properties have been found in the plant and the plant has also been extensively used in treatment of a plethora of ailments [73]. These properties have been classified under three categories – traditional medicine, folk medicine, and pharmacological evidence.

Traditional medicine practices that mainly followed are Indian Ayurvedic, Arabian Unani medicine, and Chinese medicine. The historical and cultural beliefs have made the population of Asia and Latin America to continue the use of traditional medicine [74]. Traditional medicine accounts for around 40% of all health care delivered in China. Up to 80% of the population in Africa uses traditional medicine to help meet their health care needs [75].

In Ayurveda, the plant finds its mention in the verses of the “Charaka Samhita” the most unarguable and authoritative textbook of Indian Ayurvedic medicine. *V. negundo* has been designated as an anthelmintic (verse Su: 4-15) and is prescribed as a vermifuge (verse Vi: 7-21) in the exposition on the Charaka Samhita by Sharma [76]. Other Ayurvedic uses of *V. negundo* are described by Tirtha [77]. People sleep on pillows stuffed with *V. negundo* leaves to dispel catarrh and headache and smoke the leaves for relief. Crushed leaf is applied to cure headaches and other skin wounds [78]. Essential oil obtained from the leaves is effective in the treatment of venereal and other skin diseases. The leaf decoction along with piper nigrum is used to treat catarrhal fever with heaviness of head and dull hearing [79].

Tincture of root bark provides relief from bladder irritation and rheumatism. Jadhav and Bhutani [80] reported the Ayurvedic use of *V. negundo* in dysmenorrhea. Patkar [81] refers the formulations mentioned in the book of Anubhoga Vaidya Bhaga, which is a compendium of formulations in cosmetology, which outlines the usage of *V. negundo* leaves along with *Azadirachta indica*, *Eclipta alba*, *Sphaeranthus indicus*, or *Carum copticum* in a rejuvenation treatment process known as Kayakalpa. In Unani medicine, Khare [82] outlines the applications of *V. negundo*, commonly known as Nisinda in Unani medicine. The seeds are administered internally with sugar cane vinegar for removal of swellings; it is also used in spermatorrhoea and serves as an aphrodisiac when dispensed along with dry *Zingiber officinale* and milk [83].

In Chinese medicine, Pharmacopoeia prescribes the fruit of *V. negundo* in the treatment of reddened, painful, and puffy eyes; headache; and

arthritic joints [84]. The Folklore systems of medicine serve a large segment of population even today, especially in rural and tribal areas, regardless to the advancement in modern medicine [85].

Ziziphus mauritiana

Botanical names: *Ziziphus mauritiana* Lamk

Family: Rhamnaceae

Species: *Z. mauritiana*

Z. mauritiana is a rapidly growing medium-sized tree with a rapidly developing taproot, a necessary adaptation for drought conditions [86]. The species vary widely in height, from a bushy shrub 1.5-2 m tall, to a tree of 10-12 m tall with a trunk diameter of 30 cm.

Z. mauritiana belongs to the species of the genus *Ziziphus tourn.* ex L. family rhamnaceae. The name *Ziziphus* is related to an Arabic word which is used along the North African coast area. *Zizoufo* is used for *Ziziphus lotus* (L.)Desf., but it is also related to the ancient Persian words *zizfum* or *zizafun*. The ancient Greeks used the word *ziziphon* for the jujube [90].

Z. mauritiana may erect or wide-spreading. It has drooping thorny branches with zigzag branchlets and a thornless or with a set of short, sharp straight or hooked spines [87]. The fruit can be eaten raw or pickled. It is used in beverages because it has vitamin C. It is second only to guava and much higher than citrus or apples [88].

In India, the ripe fruits are mostly consumed raw but are sometimes stewed. The chemical composition is rich in vitamin C plus, it contains Jujubosides A&B (seeds) with zizogenin, and zeatin. It also has frangulofoline, saponin, etc. The seeds have found to have compositions such as betulinic aldehyde and acids such as betulinic acid and ceanotholic acid. It also contains frangulofoline, spinosin, beta-sitosterol, daucosterol, daucosterol-6'-octadecanoate, sucrose, docosanoic acid, stearic acid, and palmitoleic acid [89].

During 1500 BC, Jujubes were eaten by the ancients of the chalcolithic age. The fruits have been cultivated for the past 400 years in both India and China. These fruits have been quite frequently mentioned in Veda, such as the Sutras, epics, medical texts, and other literature [91].

Three types of jujubes are mentioned in Veda and Brahmanas. They are Badara with large-sized fruit, the Koal or Ktmila with average sized fruit, and Karkandhu with orange-reddish fruit; whereas, the first two types appear to be *Z. mauritiana*, and the third type, with its red fruit, appears to be *Ziziphus nummularia* [92].

Z. mauritiana is extremely drought hardy and is dominant component of the natural vegetation in the Indian "Thar desert." It can be successfully cultivated even in the most marginal ecosystem of the tropics and subtropics. 90,000 ha plantation of improved bare trees has made in India, which have average productivity of 8.34 tons per hectare [93].

However, all jujubes remain relatively minor crops, although demand for production remains steady in various parts of world, especially India where they were originally domesticated [94]. *Z. mauritiana* is considered as an underutilized crop and is included in national program on underutilized crops. In spite of the fact that *Z. mauritiana* has tremendous medicinal properties, attributed by a diverse group of secondary metabolites it is neither considered as an important medicinal plant nor as a utility for medicinal use in mainstream therapeutics [95].

Thus, this paper provides a dignified review of information regarding the ethnopharmacological uses, pharmacological activity, and phytochemical constituents of the plant *Z. mauritiana*, with the purpose of drawing scientific focus of this underutilized medicinal plant, for strategic planning to optimize judicious, sustainable use, and long-lasting conservation. The fruits are a good source of vitamin

C and sugars. It contains appreciable amounts of mineral constituents. A typical analysis of the pulp shows 82 % moisture, 0.8 protein, and 0.3 fat, carbohydrates, 17.0; and minerals, 0.3%; calcium, 4; phosphorus, 9; iron, 1.8; carotene, 0.021; thiamine, 0.02; riboflavin, 0.02; niacin, 0.7; and vitamin C, 76 mg/100 g. The presence of fluoride (0.1-0.2 ppm) is reported; pectin content (as calcium pectate) is 2.2-3.4%, on moisture-free basis [96].

Fresh fruits contain quercetin. The total lipid content of jujube fruit is very low. The predominant fatty acids in jujube are oleic acid, linoleic acid, palmitic acid, and palmitoleic acid. Palmitic acid is the main saturated fatty acid while unsaturated fatty acids range from 68.54% to 72.44% of the total fat present in jujube fruit. Therefore, jujube fruits can be recommended by nutritionists to be part of our daily diet [97].

Z. mauritiana varieties include Gola, Umran, Thar Bhubhraj, Thar Sevika, Banarasi Karaka, Illaichi, Seb, Ponda Tikadi, Katha, Bawal-Sel-1, Sanaur-2 etc. From top to root, *Z. mauritiana* is useful, as food, fodder, nutrient, medicine, construction material or as fuel.

As per ayurveda and ethnomedicinal claims, *Z. mauritiana* has tremendous medicinal properties, attributed by alkaloids. Although in-depth phytochemical investigation of *Z. mauritiana* has been carried out, each phytoconstituent has unique and multifactorial properties [98]. Undisputed value of *Z. mauritiana* is seen in health products and their wide geographical range means they can provide a potentially cheaper and more accessible source of such compounds for traditional medicine [99].

Mucuna pruriens

Botanical name: *Mucuna pruriens* L.

Family: Fabaceae

Species: *M. pruriens*

The plant is an annual climbing shrub with long vines that can reach over 15 m (50 ft) length. Young plants are covered by fuzzy hairs, but when older, it is almost completely free of hairs [100]. The leaves are tripinnate, ovate, reverse ovate, rhombus-shaped, or widely ovate.

Mucuna spp. Have been reported to contain the toxic compounds L-dopa and hallucinogenic tryptamines, and anti-nutritional factors, such as phenols and tannins (Awang *et al.*, 1997). Higher concentrations of L-dopa with velvet bean is a commercial source of this substance. It is used in the treatment of Parkinson's disease [101]. Unprocessed velvet bean exhibits a low susceptibility to insect pests (Duke, 1981). Velvet bean is known for its nematocidal effects. It is also possesses allelopathic activity (Gliessman *et al.*, 1981).

Despite its hazardous properties, various species of *Mucuna* are grown as a minor food crop because raw velvet bean seeds contain approximately 27% protein (Duke, 1981). During the 18th and 19th centuries in the foothills and lower hills of the eastern Himalayas and in Mauritius, *Mucuna* was grown widely as a green vegetable. Both the green pods and the mature beans were boiled for eating purposes. The seeds of *M. pruriens* have been used for treating many dysfunctions in Unani Medicine. In Guatemala and Mexico, *M. pruriens* has been roasted and ground to make a coffee substitute; the seeds are widely known in the region as "Nescafé," in recognition of this use [102].

The plant and its extracts have been long used for various snake bites. *M. pruriens* has compounds such as levodopa and L-dopa. This is a proactive chemical precursor and has significant antioxidant. This helps in the action that works in tandem with L-dopa to promote brain health. When L-dopa crosses the blood-brain barrier, it helps increase brain levels of dopamine. It is an essential neurotransmitter associated with regulating mood and cognition [103]. It has also been studied for its effects against various snake bites such as cobra, Echis (Saw scaled viper), Calloselasma (Malayan pit viper), and Bungarus (Krait).

It has long been used in traditional Indian medicine, i.e. Ayurveda in an attempt to treat various diseases including Parkinson's disease. The phytochemicals of the seeds of the plant contain serotonin, nicotine, and bufotenine. Thus, it has been used in Siddha system of medicine for various purposes [104].

CONCLUSIONS

The need of time is to perform the pharmacological activities of isolated phytochemical, which can replace synthetic and costly medicine and attract the interest from large pharmaceutical companies. This paper provides review of information regarding ethno pharmacological uses, pharmacological activity, and phytochemical constituents of *C. amboinicus* Lour, *D. metel*, *A. nilagirica*, *L. inermis*, *V. Negundo*, *Z. mauritiana*, *M. pruriens* with the purpose of drawing scientific focus toward these underutilized medicinal plants. Thus, the present documentation of traditional knowledge will not only provide recognition of this knowledge but also help in its conservation through providing pharmacological leads for the betterment of human society.

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