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Available online at: http://www.iajps.com *Review Article*

A REVIEW ON NEUROPHARMACOLOGICAL EVALUATION OF INDIAN MEDICINAL PLANTS

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Abstract:

The worldwide frequency of mental and neurological illnesses, notably depression and dementia, has significantly escalated. Approximately 52 million individuals globally are afflicted with serious mental health issues, while 150 million have minor mental diseases, including depression and anxiety, and 30 million suffer from dementia. Mental illnesses are defined by irregularities in cognition, emotion or mood, or the most complex elements of conduct. The current efficacy of pharmacological treatments for these illnesses remains restricted owing to their significant side effects. A multitude of ways has been devised to enhance treatment efficacy and mitigate negative effects. Consequently, research into innovative medication derived from medicinal plants for the prevention of mental disorders and cognitive decline has advanced considerably.

Keywords: *Herbal medicine, Phytochemicals, Neuropharmacology, Indian Plants.*

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INTRODUCTION:

Throughout history, people have depended on plants for essential requirements such as sustenance, apparel, and habitation, all derived from plant structures (leaves, wood, fibres) and storage organs (fruits, tubers). There have been various applications for plants, such as the use of poisons for arrows and darts in hunting, the use of lethal agents for murder, the use of hallucinogens for rituals, the use of stimulants for improving endurance and suppressing hunger, as well as the use of intoxicants and medicinal applications. The majority of the compounds that are generated from plants and employed for these tasks are secondary metabolites. These metabolites are biosynthetically created from basic metabolites (such as carbohydrates, amino acids, and lipids), and they do not participate in the growth, development, or reproduction of the plant. It is possible to categorize secondary metabolites according to the chemical categories that they belong to, such as phenolics, alkaloids, and terpenoids (Harborne, 1984).

Plants have constituted the foundation of intricate traditional medicinal methods used for millennia by populations in India, China, and several other nations (Sneader, 2005). The Artharvaveda, which had a fundamental role in the development of Ayurvedic medicine in India (about 2000 BCE), the clay tablets of Mesopotamia (1700 BCE), and the Eber Papyrus of Egypt (1550 BCE) all include the earliest evidence of the use of plants as therapeutic agents. Notable literary works on medicinal plants include "De Materia Medica," which was written by Dioscorides between the years 60 and 78 CE, and "Pen Ts'ao Ching Classic of Materia Medica," which was written around the year 200 CE (Sneader, 2005).

When it came to identifying plants for the treatment of diseases, the "doctrine of signatures" was often used. This was done prior to the realization that the therapeutic effectiveness of medicinal plants is a direct result of the presence of pharmacologically active chemicals in these plants. An example of this would be the usage of goldenrod, which has a yellow tint, to cure jaundice; red plants were used to treat haematological disorders; liverworts were used to treat hepatic illnesses; pile warts were used to treat haemorrhoids; and tooth warts were used to treat dental pain. Morphine was the first pharmacologically active molecule to be recovered in pure form from a plant in the year 1805; however, its structure was not understood until the year 1923. The 19th century witnessed the isolation of various alkaloids from plants utilized as pharmaceuticals, specifically: atropine (Atropa belladonna), caffeine (Coffea arabica), cocaine (Erythroxylum coca), ephedrine (Ephedra species), morphine and codeine (Papaver somniferum), pilocarpine (Pilocarpus jaborandi Holmes), physostigmine (Physostigma venenosum), quinine (Cinchona cordifolia Mutis ex Humb.), salicin (Salix species), theobromine (Theobroma cacao), theophylline (Camellia sinensis), and (+)-tubocurarine (Chondodendron tomentosum Ruiz and Pav.) (Sneader, 2005). Subsequent to these findings, bioactive secondary metabolites derived from plants were increasingly used as pharmaceuticals, in both their natural and altered states. (Sneader, 1996; Samuelsson, 2004).

Neuropharmacology

In underdeveloped nations, notably in India, farmers, residents of tiny isolated villages, and indigenous tribes use traditional medicine to treat common diseases. Traditional healers claim that their remedies are more economical and efficacious than contemporary treatment. Individuals in these villages have a decreased chance of acquiring numerous ailments and infectious diseases from resistant microorganisms compared to urban residents receiving conventional treatments and medications. A method to avert antibiotic resistance in pathogenic species is the use of novel compounds that are not derived from current synthetic antimicrobial drugs. Traditional healers believe that some medicinal plants are more effective in treating different illnesses and infectious diseases than manufactured medications and antibiotics. It is essential to scientifically assess the possible use of traditional medicine for the healing of different common ill health and infectious diseases. Medicinal herbs may serve as an alternate therapy for non-severe instances of different illnesses and infectious infections (Abhishek Mathur et al., 2011). The chosen species used in traditional medicine.

Review Of Literature

The Indian Systems of Medicine are recognized by the National Council for Alternative Medicine (NCAM), USA; nonetheless, most of the cures claiming to address various ailments lack scientific validation. Parasnis (2004) contends that the full potential of Ayurveda may be realized alone with the use of modern investigative techniques to Ayurvedic medicines. The acceptability of any clinical trial depends on its compliance with current pharmacological and statistical standards.

Unfortunately, most practitioners of Ayurveda oppose the integration of modern research methods for evaluating the formulations used in the practice. This pertains to other conventional medical practitioners, including those under the Siddha and Unani medicinal systems. Scientific validation would not only augment the appeal of these treatments in India but also make them acceptable, to some extent, to folks in other parts of the world. Considering that many illnesses remain unresolved by traditional medicine, both locally and worldwide, investigating the effectiveness of alternative and combinatorial therapeutic approaches, substantiated by generally recognized methodology, might greatly help mankind overall.

Traditional and affordable health care

South Asia has several affluent, traditional medical systems. Ayurvedic practices originate from 5000 B.C. Together with the Unani, Siddha, and Tibetan traditions, they provide millions of people a vital source of daily health and nourishment which is essential for their survival. Ayurveda, which is the oldest medicinal system in the Indian subcontinent, has recorded more than two thousand different plant species that have therapeutic properties. Siddha and Unani have followed, as seen in Table-1.2. According to Prajapati et al. (2003), the Charak Samhita is an old treatise on herbal medicine that provides information about the manufacture of 340 herbal treatments as well as their traditional use. Both traditional health care practices and pharmaceutical (allopathic) medicines rely heavily on medicinal and aromatic plants (MAPs), which include a wide variety of plants such as trees, shrubs, grasses, and vines. South Asia is home to about 8,000 plant species recognized for their therapeutic properties.

Widespread and rising demand for medicinal plants

Table-1 The Status of various medical systems in India (Kala and Mathur, (2002))

Medical Systems					
Characteristics	**Ayurveda**	**Siddha**	**Unani**	**Tibetan**	**Homeopathy**
Medicinal plants known	2000	1121	751	337	482
Licensed pharmacies	8533	384	462	-	613
Hospitals	753	276	74	-	223
Dispensaries	15193	444	1193	-	5634
Registered practitioners	438721	17560	43578	-	217460
Under graduate college	219	6	37	-	178
Post graduate college	57	3	8	-	31

Table 2 Important medicinal plants and their uses (Kala et al., (2005)

Sl. No.	Botanical Name	Hindi name	Part used	No. of uses	Important uses
1	Acacia catechu (L.F) wild	Khair	Root, bark	16	Asthma, bronchitis
2	Aconitum ferox wall	Vatsnabh	Root	6	Rheumatism
3	Aconitum heterophyllum wall	Atees	Root	12	Fever, cough, piles, stomachache
4	Aegle marmelos (L.) Correa	Bel	Fruit, bark	31	Dysentery, diarrhea, fever
5	Alpinia galangal (L.) Wild	Kulanjan	Bulb	2	Health tonic
6	Bacopa monnieri (L.) Penn	Brahmi	Whole plant	20	Brain tonic, blood purifier, fever
7	Berberis aristata DC	Kingora	Root, stem	4	Eye diseases
8	Cassia angustifolia Vahl	Senna	Root	3	Rheumatism
9	Chlorophytum Tuberosum Bak	Safed Musli	Tuber	4	Leucorrhoea, sexual tonic
10	Commiphora wightii (Arn.) Bhandari	Guggul	Resin, bark	9	Asthma, typhoid
11	Curculigo orhioides Gaerten	Kali musli	Root	26	Asthma, dysentery, tonic
12	Curcuma zedoaria (Christ) Rose	Kachora	Rhizome	4	Jaundice, blood pressure
13	Launaea pinnatifida Cass	Bankau	Leaf	5	Diabetes, ulcers, rheumatic fever
14	Madhca Longifolia L	Mahua	Seed, leaf, bark	6	Skin diseases
15	Phyllanthus emblica L	Amla	Fruit	29	Constipation diabetes, tonic
16	Santalum album L.	Chandan	Wood	7	Dysentery, skin diseases
17	Sterculia foetida L	Jangli Badam	Seed	6	Skin diseases, rheumatism
18	Withania Somnifera (L.) Dunal	Ashwagandha	Root, Leaf	14	Eye Complaints, Asthma, cough
19	Wringhtia tinctoria Br.	Indrajava	Bark, Latex	14	Toothache, piles, dysentery

According to the World Health Organization (WHO), medicinal plants provide a feasible, cost-effective, and culturally appropriate source of basic healthcare for around 80 percent of the population in Asia. Those communities who are marginalized, rural, and indigenous and do not have the resources to access formal healthcare systems are especially dependent on these traditional medicines since they are culturally familiar, technically uncomplicated, economically accessible, and often effective. As a consequence of this, there is a significant amount of interest in developing traditional health systems in order to meet the needs for fundamental health care. This phenomenon is especially noticeable in South Asia, where the prices of modern drugs continue to rise and governments struggle to find the financial means to provide healthcare that is dependent on pharmaceuticals. All over the region, there is a substantial and long-lasting public support for the preservation and enhancement of the cultural and spiritual relevance of traditional remedies.

According to estimates provided by the World Health Organization, the current demand for medicinal plants is around fourteen billion dollars yearly. The need for raw materials derived from medicinal plants is increasing yearly by 15 to 25%, with the World Health Organization estimating that this demand may exceed US $5 trillion by 2050. The yearly value of the trade that is associated with medicinal plants in India is estimated to be more than one billion dollars. Estimates indicate that the export volume of Ayurveda goods manufactured in India has quadrupled (Sharma, 2004).

Notwithstanding the variety of commodities cultivated in the nation and the presence of a rapidly expanding pharmaceutical industry, India's contribution to global commerce remains relatively little given its extensive geographical expanse. Nonetheless, this is expected to increase swiftly with improved research contributions and effective management of the agricultural industry. To yet, India has engaged only in the export of substantial quantities of raw materials. To get a competitive edge, we must engage in low-volume, high-cost (value) commerce by enhancing the value of raw and unfinished items. Therefore, it is vital to produce genetically superior planting material in order to ensure consistency and quality, and it is also essential to adopt organized cultivation in order to offer farmers with a regular supply of raw materials. Post-harvest storage and processing methods must be developed to provide value-added final goods for direct industrial use.

Table Neuropharmacology of some Medicinal Plants and Natural Products on laboratory animals

Sl. No	Name of plant & part used	Phytoconstituents /source	Uses
1	Schinus molle L. (leaves)	ethanolic extract Rutin, (flavonoids)	antidepressant (Daniele G.et.al.,2008)
2	Aegle Marmelos (Leaves)	Methanolic extract	anxiolytic and antidepressant (Saroj kothari, 2010)
3	Caesalpinia pulcherrima L. (bark)	methanolic extracts of	anti-inflammatory, antidiarrhoeal, (Utpal Bose,et.al.,2011)
4	Azadirachta indica(neem) (leaves)	Acetone extract	CNS depressant (Kausik,et.al,2002)
5	Lagenaria siceraria Mol Standl (leaves)	petroleum ether & methanol extracts	CNS-depressant (Jayashree,et.al.,2010)
6	Leucas longifolia Benth	petroleum ether & methanol extracts	analgesic and CNS-depressant (Khairnar.et.al.2010)
7	Lippia nodiflora	Ethanolic & chloroform extract at high dose	central inhibitory (sedative), anticonvulsant & anxiolytic (Turaskar.et.al.,2011)
8	Hedychium coronarium. (rhizomes)	methanolic extract	analgesic and CNS depressant (Pritesh.et.al.,2011)
9	Terminalia arjuna (stem bark)	50% ethanol extract	acting both centrally and peripherally (K Ushna.et.al.,2011)
10	Momordica dioica (fruits pulp)	methanol & aqueous extracts	CNS depressant activity (Maharudra.et.al.,2010)

11	Anogeissus acuminate (leaves)	methanolic extract	CNS depressant (Umavasireddy.et.al.,2011)
12	Gymnosporia emerginata (leaves)	"	CNS depressant (Umavasireddy.et.al.,2011)
13	Drymis winteri	polygodial and drimanial	antinociceptive effects, on glutamatergic transmission parameters,
14	Phyllanthus	rutin and quercetine	"
15	Jathopha elliptica	jatrophone	"
16	Hedyosmum brasiliense	13HDS	"
17	Ocotea suaveolens	Tormentic acid	"
18	Protium kleinii	ab-amyrin	"
19	Citrus paradise	naringin	"
20	Soybean	genistein	Depressant on CNS (Lucia Helena.et.al.,2007)
21	Crataeva nurvala	lupeol	Depressant on CNS (Wakeel O.et.al.,2004)
22	ficus platyphylla (stem bark)	methanolic extract	anti-nociceptive, anti-infl ammatory (Salahdeen H.et.al.2006)
23	Bryophyllum pinnatum (leaf)	aqueous extract	Sedative (Abdu Razag.et.al.2007)
24	Launaea resedifolia (L.)	Ethanolic extract	Analgesic, anxiolytic and sedative effects (Sneha & Sanjay 2011)
25	Argemone Mexicana (whole Plant)	methanolic and ethyl acetate extracts	sedative (Viswanatha.et.al.,2006)

26	Cissus quadrangularis Linn. (root)	triterpenoids, flovonols, sapononis, and alkaloids	useful in controlling lithium/pilocarpine-induced epileptics (G Asuntha.et.al.,2010)
27	Indigofera tinctoria	ethanol extract	Significant effect on central nervous system but not on peripheral nervous system. (Syed Kamil.et.al.,2010)
28	Portulaca quadrifida Linn (leaf)	Ethanolic extract Alkaloids, Saponins, flavonoids, Triterpenoids/steroids, tannins and glycosides.	Anti-depression (Thaneeya.et.al.,2011)
29	Kaempferia parviflora (Krachai Dam) rhizomes	powder macerated with 95% ethanol	Antidepressant (Ram S. Jadhav.et.al.,2012)
30	Wattakaka volubilis (Linn.f) Stapf. leaves	Ethanolic extract, Wattakaka volubilis sapogenin,mixture & drevogenins isolated	CNS stimulant (Mansour A & Al-Hazmi.2002)
31	Anchusa affinis	aqueous extract	"
32	Fumaria parviflora	"	"
33	Peganum harmala	"	Antidepressant like Activity (Aldermen.el.al.,2011)
34	Tetracarpidium conophorum (African walnut)	aqueous extract	Anxiogenic, Sedative & analgesic (Ganeshchandra.et.al.,2001)
35	Myristica fragrans	n-hexane extract	Anxiolytic (Miguel Coleta.et.al.,2006)

36	Passiflora edulis Sims	Total flavonoids fraction (Luteolin-7-O-[2-rhamnosylglucoside]	Adjuvant therapy along with standard anticonvulsants (Tandon and Gupta.2005)
37	Vitex-negundo Linn(Leaves)	Ethanolic extract	Anticonvulsant & Sedative (E.Ngo Bum.et.al.,2008)
38	Cissus quadrangularis Linn(stem)	aqueous extract	Analgesic and with some psychoactive in absence and tonic-clonic seizures (Hector.et.al.,2008)
39	Cestrum nocturnum Linn(leaves)	Decoction	Anticonvulsant & Sedative (Hossein.et.al., 2002)
40	Crocus sativus L. stigma	Aqueous & Ethanolic extract	Neuromodulatory effects on nigrostriatal dopaminergic system. (Ashish.et.al.,2009)
41	Pongamia pinnata Linn (Leaf)	Ethanolic extract (flavonoids)	Anxiolytic and anticonvulsant (Umar Kyari.et.al.,2003)
42	Ficus Sycomorus L (stem bark)	Aqueous extract	Neuromodulatory effects on nigrostriatal dopaminergic system (Vengadesh Prabu.et.at.,2009)
43	Acrous calamus (Leaves)	Methanol and acetone extracts	Anticonvulsant activity mode of action due to GABA aminergic mediation, glycin inhibitory mechanism (Edvaldo Rodrigues.et.al.2009)
44	Cissus sicyoides L (Leaves)	Flavonoids, Linalool, α-Tocopherol	Antidepressant like effect interaction with adrenergic, dopaminergic & serotonergic system

45	Plumbago zeylanica Linn (Leaf)	Hydroalcoholic extract	CNS stimulant (Owolabi O.et.at.,2008)
46	Plants belonging to family Malvaceae	Flavonoids (Gossypin)	Antidepressant like effectinteraction with adrenergic,dopaminergic & serotonergic system (Dinesh Dhingra.et.al.,2007)
47	Kigelia africana (stem bark)	Ethanolic extract	Antidepressant (M.C Hellion-Ibarrola.et.al.,2008)
48	Terminalia Bellirica Roxb.(fruits)	Aqueous and Ethanolic extracts	" (Mahmoudi.et.al.,2009)
49	Aloysia polystachya (Griseb) Moldenke	Hydro-ethanolic extract	Potent anxiolytic, nootropic, (Emamghoreishi.et.al.,2009)
50	Artemisia absinthium L (Arial part at flowering stage)	Methanolic extract	Anticonvulsant and CNS depressant (Sudhakar Pemminati.et.al.,2010)
51	Melissa officinalis (Leaves)	Aqueous extract	Anxiolytic, Nootropic and sedative (Deb Lokesh.et.al.,2011)
52	Emblica officinalis (Fruits)	"	Mild to moderate anxiolytic effect (Akindele AJ.et.al.,2010)
53	Thuja occidentalis Linn (Arial part)	"	Mild to moderate Anxiolytics & Sedative (Bijan Shafaghi.et.at.,2002)

54	Byrsocarpus cocineus Schum. and Thonn. (leaf)	Presence of flavonoids, alkaloids and terpenoids in the plant aqueous extracts	CNS Stimulant (Alam Khan.et.at.,2007)
55	Echium amoenum L(flowers)	Hydroalcoholic & aqueous extract(Saponins, flavonoids, unsaturated terpenoids and sterols)	CNS depressant (T.Prakash.et.al.2002)
56	Laportea crenulata (roots)	Petroleum ether and chloroform fractions	Psychopharma-Cological activity, Nootropic (V.Suba.et.al.,2002)
57	Wedelia calendulacea (stem)	Methanolic & aqueous extracts	CNS depressant, Sedative (T B. Al-Naggar.et.al.,2005)
58	Barleria lupulina Lindl.(arial parts)	Methanolic extract	Nootropics (V D Thakur.2005)
59	Nigella sativa L. (Defatted seeds)	aqueous & methanolic extracts	Sedative-hypnotic potentiation, anxiolytic, (Samson Amos.et.al.,2001)
60	Eclipta alb (Linn) Hassk	aqueous & hydroalcoholic	Anticonvulsant and antinociceptive (M E Gonzalez-Trujano.et.al.,2006)
61	Sphaeranthus senegalensis	aqueous extract	Facilitation of learning memory, anti hypoxic and analgesic activity without affecting motor coordination. As nervine tonic (Vyawahare N S.,2010)
62	Ruta chalepensis (arial part)	Ethanolic extract (alkaloids, flavonoids, coumarins, tannins, volatile oil, glycosides, sterols and triterpenes)	Sedative (A.M.Musa.et.al.,2008)

63	Trapa Bispinosa (fruit)	Hydroalcoholic extract	CNS depressant (S R Katade.et.al.,2008)
64	Cissus cornifolia (Vitaceae) Leaf	Methanolic extract	" (Khan A.et.al.,2008)
65	Sterculia guttata (seeds)	Ethanolic extract	Contains sedative substance act via centrally-mediated actions rather than peripheral neuromuscular blockade (F.C.Nwiyi & H.O.Kwanashie.2009)
66	Peperomia Pellucida (Leaves)	"	
67	Sorghum bicolor (Leaves)	Aqueous methanolic extract	

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