



Traditionally Used Medicinal Plants with Central Nervous Activity - An Overview

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ABSTRACT

Since ancient times, people have used therapeutic herbs, and it's possible to say that this practice is where modern medicine started. Plant-derived chemicals have been and continue to be significant sources of molecules for pharmaceuticals. The evolution of human culture has depended greatly on the use of medicinal herbs. Medical plants have historically been at the forefront of almost all cultures and civilizations as a source of medicine. Many of the current medicines are made from medicinal plants, which are regarded as rich sources of traditional remedies. Medicinal herbs have been used for thousands of years to treat illnesses, taste and preserve food, and stop disease epidemics. The biological traits of plant species that are used all over the world are typically attributed to the secondary metabolites that plants produce. We provided a general summary of the historically employed medicinal herbs with central nerve activity in this review.

Keywords: Medicinal plant, Secondary metabolites, Medicine, Disease epidemics, and Biological traits.

INTRODUCTION

The way of life of plants is quite adaptive. Approximately 10% of vascular plants are used as medicines. Approximately 80% of people on the planet use traditional medicine (WHO, 2022). Every part of the plant is beneficial to all life on Earth and throughout the universe. These healing plants are essential for maintaining human health since they provide a wealth of potent medicines. Plants have a very flexible way of living. 10% of vascular plants are used as medicines, which is a very tiny number. It's crucial to maintain the health of those using these medicinal plants because they are a reliable source of many effective and powerful medicines. ^[1]

The medicinal potential of plant products may be traced back more than 5,000 years, as there is evidence that the Indian, Egyptian, Chinese, Greek, and Roman civilizations employed them to heal diseases and revitalize bodily systems. It has been proven that employing plants as a source of research in the search for chemical compounds with therapeutic activity generates a significant amount of scientific output. Because of their understanding of the growth of concepts related to the use of medicinal plants as well as the development of awareness, chemists, and doctors are better able to respond to problems that have arisen with the proliferation of professional services in the facilitation of man's life. ^[2-4]

All socioeconomic strata in India make extensive use of therapeutic potentials, both as traditional medicines employed in Siddha, Ayurveda, and Unani medicinal systems and as processed pharmaceutical sector products. Phytochemicals, which are organic compounds included in plants, vegetables, and fruits, work with nutrients and fiber to combat disease. The secondary metabolites present in therapeutic plants include alkaloids, phytosterols, glycosides, phenols, flavonoids, and diterpenes. These tertiary metabolites give medicinal plants significant therapeutic potential. India's healthcare system heavily relies on the utilization of medicinal plants as a source of medication. ^[5-7]

Traditional remedies are receiving a lot of attention from the general public, academia, and government as a result of the escalating side effects of dangerous drug responses and the high cost of modern medicine. In light of this, there has been an increase in interest in the field of study in natural product chemistry. Necessary to record the traditional knowledge-related medicinal plants that are in danger of going extinct. Therefore, it is imperative to maintain this indigenous knowledge of traditional medicine through precise documentation, plant species identification, and herbal preparation. The development of the most widely used medicinal herbs should involve the local communities. ^[8-10]

The majority of pharmacological medications are still those that affect the central nervous system (CNS), which early humans were among the first to recognize. This medicine is prescribed to treat a range of neurological and mental conditions. The integration of sensory data, the production of muscular output, and other behaviours required for fruitful interaction with the environment and fostering species survival are all functions of the central nervous system (CNS). It is composed of the brain and spinal cord. The human brain contains over 100 billion connected neurons and is encircled by varieties of supportive glial cells.

Despite this, there have been substantial developments in CNS pharmacology in recent years. It's now possible to study how drugs affect certain cells, even particular ion channels inside synapses. The information gathered from these studies formed the basis for numerous important developments in CNS research.

First and foremost, it cannot be disputed that practically all drugs with CNS side effects have been impacting certain receptors that alter synaptic transmission. Even though only a small number of drugs, such as alcohol and general anesthetics, are known to have effects on membranes that are not receptor-mediated, it is nonetheless evident that these actions have been impacting synaptic transmission.

Second, drugs are among the most essential resources for studying all parts of CNS physiology, from the mechanisms underlying convulsions to the development of long-term memory. Agonists and natural transmitter-like agonists that are frequently more selective than endogenous substances are highly useful in these tests.

Third, some of the most interesting hypotheses regarding the pathophysiology of the disease have developed as a result of the analysis of the impacts of drugs with proven clinical efficacy. For instance, important hypotheses about the pathophysiology of schizophrenia have their roots in our understanding of how antipsychotic drugs influence dopamine receptors. Research on the actions of various agonists and antagonists on gamma-aminobutyric acid (GABA) receptors has led to new theories on the pathophysiology of numerous illnesses, including anxiety and epilepsy.^[11]

The substances that impact the central nervous system have the greatest sub-classifications in this area of pharmacology. The body's sigma and mu receptors are the main targets of narcotic analgesics, which diminish the patient's experience of pain. Non-narcotic medications reduce prostaglandin synthesis, which reduces the inflammatory response. The readily available levels of acetylcholine or acetylcholinesterase are either increased or decreased by cholinergic medications. Adrenaline, which affects the sympathetic nervous system, either stimulates or suppresses the alpha or beta reactions. The majority of these adrenergic drugs, including metoprolol, have particular beta1 receptor locations.

The CNS stimulants increase the quantity of cellular impulse transmission by increasing the availability of the neurotransmitter norepinephrine. Anticonvulsants can raise GABA levels, lower acetylcholine levels, promote the clearance of Na⁺ from the cell, or prevent it from entering. Sedatives and hypnotics reduce activity in the cortex and thalamus, which receive sensory input from the brain. Antidepressants typically perform one of two actions: either increase norepinephrine and serotonin levels in the brain and stop the production of the enzyme monoamine oxidase (MAO), which breaks down neurotransmitters. Antipsychotic medications either stop dopamine receptor sites in the brain from reacting or decrease the medulla's receptivity. Additionally, anxiolytics alter limbic center responses or increase GABA levels.^[12]

PLANTS WITH ANTICONVULSANT ACTIVITY

Withania coagulans

An upright, grey undershrub in the Solanaceae family is called *Withania coagulans*. This study's goal was to evaluate the *Withania coagulans* fruit's crude methanolic extract's ability to prevent seizures. Models of chemically-induced seizures and maximal electroshock seizures (MES) were employed to screen this activity. As a result, it was concluded from the trials that the *Withania coagulans* extract has anticonvulsant properties.^[13]

Cajanus cajan

The perennial plant *Cajanus cajan* (L.) Millsp, sometimes known as the pigeon pea plant, is a member of the Fabaceae family. The flavanone (substituted) from *Cajanus cajan* (L.) Millsp has *in vitro* neuroactive function due to the presence of phytoconstituents such as flavonoids. Pinostrobin, a flavanone, aids in the inhibition of voltage-gated sodium channels. Therefore, the current study was conducted to assess the antiepileptic activity of an ethanol extract of *Cajanus cajan* leaves in rodents.^[14]

Phyllanthus amarus

This study aimed to determine whether *Phyllanthus amarus* could prevent seizures caused by pentylenetetrazole (PTZ) and maximum electroshock (MES). Swiss albino rats were used to test the aqueous and ethanolic extracts of *Phyllanthus amarus* leaves and stems for their ability to prevent MES and PTZ-induced convulsions (70 mg/kg, p.o.). The number of animals protected against tonic convulsions and the latency of tonic convulsions were noted.^[15]

Ficus benjamina

Evergreen *Ficus benjamina* L., also referred to as a weeping fig, is a native of Southeast Asia. The *Ficus benjamina* L. aqueous extract offers a number of therapeutic benefits, including biological effects on the central nervous system. Defatting with petroleum ether for 16 hours, soxhlation with 70% methanol (1:10 w/v) for 24 hours, and standardisation of the extract using HPLC were the steps used to create the extract from dried figs of *Ficus benjamina* L. (FBE). The maximal electroshock model caused electro convulsions, and picrotoxin caused chemo convulsions.^[16]

Clerodendrum infortunatum

An essential and frequently used medicinal herb in Indian traditional medicine is *Clerodendrum infortunatum* Linn. (Verbenaceae). In this investigation, the ethanolic extract of *Clerodendrum infortunatum* Linn leaves anticonvulsant properties are assessed in test animals.^[17]

Adansonia digitata

In this study, Wistar rats that had been subjected to pentylenetetrazole (PTZ)-induced convulsions were examined for the anticonvulsant effects of a methanol stem bark extract of *Adansonia digitata*. The traditional usage of *Adansonia digitata* for the treatment of epilepsy was supported by the discovery in this study that methanol stem bark extract of this plant contains phytochemicals that may be the cause of the anticonvulsant effect reported. ^[18]

Otostegia persica

Mice were given pentylenetetrazole (PTZ) to elicit convulsions and the anticonvulsant activity of *Otostegia persica* whole extract was tested. Diazepam was used as the reference medication. These findings substantiate the ethnomedicinal claims that *Otostegia persica* is used to treat seizures by suggesting that the extract has physiologically active components with anticonvulsant efficacy. ^[19]

Albizia Amara

Albizia amara is a significant medicinal plant in the Fabaceae family. This study aims to screen the anticonvulsant activity of *Albizia amara* leaves ethanolic extract using pilocarpine-induced seizures in albino rats. An *in-silico* study is performed to identify the probable targets responsible for the mechanism of action. ^[20]

Pentas schimperiana

Pentas schimperiana is a semiwoody, shrubby herb that grows up to 2 metres tall. *Pentas schimperiana* root bark extract and solvent fractions were tested in this study to determine their anticonvulsant effects on mice. The maximal electroshock-induced seizure test and pentylenetetrazole were used to assess the anticonvulsant activity. ^[21]

Lantana camara

The present study was planned with the objective of evaluating the antiepileptic activity of *Lantana camara* flowers in mice. Maximum electric shock (MES) and pentylenetetrazole-induced (PTZ) models of epilepsy were employed in the present study. Among the various extracts prepared were petroleum ether, chloroform, ethanol, and aqueous. Pentylenetetrazole induced only ethanol and chloroform extracts by successive solvent extraction methods, which showed significant antiepileptic activity in this MES and PTZ model of epilepsy. ^[22]

PLANTS WITH PARKINSON'S DISEASES

Cyamopsis tetragonoloba

In the current study, we assessed the Anti-Parkinson's activity of *Cyamopsis tetragonoloba* methanol plant pod extract using *in vivo* assays to determine neurochemical parameters such as GSH, LPO and SOD as well as haloperidol-induced catalepsy and tacrine-induced vacuous jaw movements for behavioural parameters. Using behavioural research, it was discovered that *Cyamopsis tetragonoloba* methanol plant pod extract (200 and 400 mg/kg) considerably (P 0.001) reduced the catalepsy produced by haloperidol induction of catalepsy. The investigations demonstrated that the methanol pod extract of *Cyamopsis tetragonoloba* had a strong Anti-Parkinson's action. ^[23]

Barleria Cuspidata

Barleria cuspidata is a member of the Acanthaceae family. The continuous hot percolation process was used to perform various extracts. The anti-Parkinson's activity of a rotenone induced animal model in albino rats was investigated *in vivo* in this study. The neuro biochemical study of the results showed activity against brain cell injury. The objective of the current research is to examine the neuroprotective and Parkinson's disease-preventing properties of *Barleria cuspidata* encapsulated glutathione in an animal model of rotenone-induced Parkinson's disease. ^[24]

Acorus calamus

The medicinal plant *Acorus calamus* Linn (rhizome) contains a wide range of phytochemicals and potential pharmacological actions. On the basis of the effects on parameters in the haloperidol schedule, it was confirmed that no side effects will be seen in healthy animals at the chosen dose after extract at selected doses of 200 mg/kg and 400 mg/kg were found to have no significant impact on normal behavioural. The current investigation lends support to the local healers' long-standing usage of *Acorus calamus* as a traditional remedy for catalepsy. ^[25]

Brassica juncea

The current study used behavioural, *in vivo*, and *in silico* experiments to assess the therapeutic potential of *Brassica juncea* leaves for the treatment of Parkinson's disease (PD). Rats were placed into six groups (n = 6) for *in vivo* experiments. Normal control (vehicle control) was provided by Group I. Disease prevention in Group II involved haloperidol (1 mg/kg). Group-III (L-Dopa 100 mg/kg + carbidopa 25 mg/kg) was kept as the control group. The treatment groups (IV-VI) received extract orally for 21 days at dosages of 200, 400, and 600 mg/kg, respectively. Results from an *in vivo* investigation revealed that the extract enhanced balance, motor coordination, and muscle strength in people with Parkinson's disease. During the trial, these dopamine levels rose and monoamine oxidase B (MAO-B) levels fell dose-dependently in the brain. ^[26]

Tribulus terrestris

The current study's objective was to investigate any potential anti-Parkinson's effects of *Tribulus terrestris* methanol extract. According to the theory, a methanol extract of *Tribulus terrestris* has antioxidant potential and can treat Parkinson's disease (PD) via modifying synuclein, acetylcholinesterase

(AChE), TNF-, and IL-1. Giving haloperidol, 1 mg/kg, intraperitoneally prepared the PD model in rats. It is concluded that the methanol extract of *Tribulus terrestris* may lessen Parkinson's disease symptoms.^[27]

Portulaca oleracea

Portulaca oleracea seed methanolic extract is tested for its antioxidant and anti-Parkinson effects. The antioxidant capabilities of the extract were determined by nitric oxide free radical scavenging activity and reducing power using the FeCl₃ method. Two behavioural models, orofacial dyskinesia and haloperidol-induced catalepsy, were used to assess the anti-Parkinson activity. In mice, haloperidol causes catalepsy.^[28]

Malaxis acuminata

The study uses the SH-SY5Y cell line to examine in-vitro screening of the *Malaxis acuminata* plant's overall anti-Parkinson's activity. The *Malaxis acuminata* powdered plant was extracted using the Soxhlet process with nonpolar to polar solvents. In order to cause toxicity in SH-SY5Y cell lines, rotenone (10 mM) was used. The cell lines were then treated with 100g, 50g, 25g, 12.5g, and 6.25g of ethanolic extract of *Malaxis acuminata*, and the cells were inoculated at 37°C in a humidified 5% CO₂ incubator. The highest efficient concentration for preventing cell proliferation was found to be 6.25g/ml.^[29]

Murraya koenigii

The purpose of the current study is to assess the effectiveness of *Murraya koenigii* leaf aqueous extracts in preventing rat paraquat (PQ)-induced Parkinsonism. In this study, the effects of *Murraya koenigii* (100, 200, and 400 mg/kg, p.o.) on rat catalepsy, muscle rigidity and locomotor activity as well as its effects on neurochemical parameters such as malondialdehyde, catalase (CAT), glutathione (GSH) reductase, glutathione (GSH) peroxidase, and GSH were examined.^[30]

Musa Paradisiaca

The two following experimental models were used to evaluate the current anti-parkinsonism investigation. Unripe fruit juice from *Musa paradisiaca* was found to significantly increase the number of rotations in the despair swim test, the number of squares travelled in the open field test, the hanging time in the hang test, the fall of time in the horizontal bar test, and the number of squares travelled, respectively, when compared to the disease control.^[31]

Origanum majorana

Origanum majorana leaf extract was evaluated in this regard for its antioxidant, anti-Parkinson's, and neuroprotective properties. The antioxidant property was assessed by two *in-vitro* methods, nitric oxide radical scavenging assay and phosphomolybdenum assay. The anti parkinson's property was assessed in haloperidol-induced Parkinson's disease in mice using the Catalepsy Bar Test and Rota Rod Test.^[32]

PLANTS WITH ANTI ALZHEIMER'S ACTIVITY

Convolvulus pluricaulis

A member of the Convolvulaceae family, *Convolvulus pluricaulis*, is used to improve memory. According to a study, *Convolvulus pluricaulis* aqueous extract and ethyl acetate improve memory and learning. By controlling the body's production of stress chemicals like cortisol and adrenaline, this plant has been shown to soothe nerves. This plant ethanol extracts dramatically enhanced rats' learning capacity and memory retention. *Convolvulus pluricaulis* administration boosted the activity of the enzyme acetylcholinesterase in the hippocampal CA1 and CA3 areas linked to memory and learning.^[33-36]

Ginkgo biloba

The Ginkgoaceae family includes the Chinese native *Ginkgo biloba*. This extract was calculated to have 6% terpene lactones and about 24% flavonoids. Standardized *Ginkgo biloba* extract exhibits many molecular and cellular neuroprotective pathways, including reduction of apoptosis, suppression of membrane lipid peroxidation, anti-inflammatory properties, and inhibition of amyloid aggregation formation. Acetylcholinesterase activity is greatly reduced by ginkgo biloba extract in the brain, and scopolamine-induced deficiencies in passive avoidance were improved when AChE activity was inhibited. Reduced acetylcholinesterase activity reflects an increased acetylcholine baseline level.^[37-40]

Bacopa monnieri

The Scrophulariaceae family, which includes *Bacopa monnieri*, is found in marshy and wet environments. In Ayurvedic medicine, it is frequently used as a diuretic, nerve tonic, cardiogenic, and as a treatment for asthma, sleeplessness, epilepsy, and rheumatism. *Bacopa monnieri* has historically been used to improve memory and other cognitive abilities. Numerous studies have been conducted to determine the neuropharmacological effects and nootropic properties of *Bacopa monnieri* extracts. *Bacopa monnieri* increases protein kinase activity in the hippocampus, which helps explain how it improves memory. Lower reactive oxygen species levels were observed in neurons treated with *Bacopa monnieri* extract, indicating that *Bacopa monnieri* reduced intracellular oxidative stress.^[41-43]

Centella asiatica

The Apiaceae family, of which *Centella asiatica* is a member, includes Bangladesh and Sri Lanka in addition to India. The disease caused by amyloid in mice's brains was reversed, and elements of the oxidative stress response were altered, by extracts of *Centella asiatica*. It is a crucial plant for the brain and nerve cells and is thought to be able to improve intelligence, memory, and longevity. [44-45]

Curcuma longa

The Zingiberaceae family member *Curcuma longa* has anti-inflammatory properties that are also linked to a lower incidence of Alzheimer's disease. In the brain, plaque deposition is decreased by curcumin. It lessens amyloid pathology and oxidative stress. According to epidemiological studies, the prevalence of Alzheimer's disease is 4.4 times lower in Southeast Asian nations where turmeric is regularly used in cooking. According to a study, as compared to a control treatment, low dosages of curcumin reduced the level in mice with Alzheimer's disease by up to 40%. Curcumin reduced the amount of plaques in rats with Alzheimer's disease's brains by 43% at lower doses. According to a different study, turmeric's anti-inflammatory qualities are associated with a lower incidence of Alzheimer's. [46]

Glycyrrhiza glabra

The family Fabaceae includes *Glycyrrhiza glabra*. In scopolamine-induced dementia, this herb has been proven to enhance memory. According to some reports, *Glycyrrhiza glabra* helps mice remember things better. Over the course of seven days, mice were administered plant extracts at three different dose levels (75, 150, and 300 mg/kg), with the 150 mg/kg dose proving to be the most effective at enhancing memory. This may help in the treatment of AD. [47-48]

Withania somnifera

The root of *Withania somnifera*, among the members of the Solanaceae family, is widely used. It has antioxidant properties and the ability to scavenge free radicals, and it strengthens the immune system. Since *withania somnifera* has a soothing effect while other adaptogens tend to stimulate, it is effective in treating Alzheimer's disease in adults. [49-50]

Lepidium meyenii

It is a member of the Brassicaceae family and is renowned for enhancing memory and learning. In patients with Alzheimer's disease, it showed activity that improved cognition. It improves memory by raising the level of acetylcholine. It improves memory impairment brought on by ovariectomy, in part because of its antioxidant and acetylcholinesterase inhibitory actions. [51-52]

Magnolia officinalis

It strengthens memory problems brought on by scopolamine and is a member of the Magnoliaceae family. The activity of acetylcholinesterase is inhibited. Magnolol and honokiol, which come from the *Magnolia officinalis* plant, can improve the effects of choline acetyltransferase. It has also been proven to release acetylcholine from the hippocampal nucleus and block acetylcholine cleavage. Honokiol has anti-inflammatory properties by inhibiting the production of reactive oxygen species. *Magnolia officinalis* anti-inflammatory and antioxidant properties are crucial for treating Alzheimer's disease. [53]

Tinospora cordifolia

Tinospora cordifolia, a member of the Menispermaceae family, has the ability to improve memory in both healthy and memory-impaired animals. This choline supplementation improves cognitive function by stimulating the immune system and enhancing acetylcholine production. *Tinospora cordifolia* is regarded as a booster of memory and learning in Ayurveda. *Tinospora cordifolia* root aqueous extract improves verbal learning and logical memory. [54]

Saraswata Ghrita

An effective memory booster *Saraswata Ghrita* is a multi-ingredient traditional preparation. Additionally, it improves speech, IQ, memory, and digestive ability. Comprehensive reviews of ayurvedic classical texts, online databases, and search engines for scientific literature were conducted. *Saraswata Ghrita* is mentioned in about fourteen classical treatises, according to a screening. It has primarily been mentioned in relation to how it affects mental processes, taking into account Medhya or Smruti Vardhaka (a memory booster). This suggests that the entire composition, *Saraswata ghrita*, may be useful in treating Alzheimer's disease. [55]

PLANTS WITH ANTIDEPRESSANT ACTIVITY

Acorus calamus

An aromatic, annual, semi-aquatic plant called *Acorus calamus* (Araceae) can be found in Europe, North America, and Asia. Native Americans, Americans, Chinese, and other cultures frequently use its rhizomes. In this study, the antidepressant efficacy of methanolic and hydroalcoholic extracts of the rhizome component of *Acorus calamus* in mice was examined. With a reduction in immobility duration of 23.82% and 20.59%, respectively, the extract at 100 mg/kg and 400 mg/kg was found to have the best antidepressant efficacy. This study reveals that the central neurochemical and hypothalamic-pituitary-adrenal (HPA) axis are modulated by *Acorus calamus* rhizome extract, mediating antidepressant action in response to FST and TST-generated stress. [56]

Macaranga barteri

The plant *Macaranga barteri*, which is used to treat anxiety in conventional medicine, was the subject of this investigation. The objective of the study was to determine whether an aqueous extract of *Macaranga barteri* had an antidepressant-like effect on rats and to look into potential mechanisms underlying this effect. [57]

Amaranthus Spinus

The Forced Swimming Test (FST) and Tail Suspension Test (TST) models were used to examine the antidepressant efficacy of the methanolic extract of *Amaranthus spinosus* (MEAS). Imipramine and escitalopram were employed as benchmarks. [58]

Caesalpinia pulcherrima

In this study, Swiss young male albino mice were used to test the antidepressant-like action of an ethanol extract of *Caesalpinia pulcherrima* leaves. In the tail suspension test (TST), fluoxetine and ethanol extract (200 and 400 mg/kg) significantly shortened the immobility duration in both stressed and unstressed mice, respectively. The immobility duration of stressed mice in the TST was dramatically reduced even at the lowest dose of the extract (100 mg/kg). In stressed mice, the extract effectively reversed the lower sucrose desire. [59]

Tridax procumbens L

To examine in mice if an aqueous or methanolic extract of *Tridax procumbens* plant flowers has antidepressant properties. Forced Swim Test (FST) and Tail Suspension Test (TST) were used to assess the antidepressant efficacy of aqueous and methanolic extracts of *Tridax procumbens* plant flowers in albino mice. The conclusion drawn from the aforementioned findings is that METP displayed more antidepressant activity, as seen by the reduction in immobility time in the FST and TST. [60]

Mimosa pudica

To assess whether Swiss Albino mice suffering from depression respond to an ethanol extract of *Mimosa pudica* (EEMP) leaves. We used 20–30 g of Swiss albino mice of either sex. By subjecting the mice to the Forced Swim Test (FST) and Tail Suspension Test (TST) on the first and tenth days, the antidepressant potential of EEMP was assessed. According to the study, the ethanolic extract of *Mimosa pudica* possesses antidepressant properties, and additional research may show that it can be used to treat depression. [61]

Cassine albens

In this study, olfactory bulbectomized mice were given ethyl acetate and chloroform fractions of a methanolic extract of *Cassine albens* for 28 days. The aim of the study is to test the traditional claims of an antidepressant effect in these mice. The effectiveness of antidepressants was evaluated using the forced swim test, open field test, and splash test. Imipramine (10 mg/kg) served as the reference standard for the entire investigation. The 200 mg/kg and 400 mg/kg chloroform fractions of *Cassine albens* exhibit a significant antidepressant effect. [62]

Griffonia simplicifolia

The goal of the current investigation was to assess the acute and long-term behavioural and antidepressant effects of *Griffonia simplicifolia* leaf aqueous extracts in standardized rat models of depression. For behavioural tests to assess the antidepressant activity, such as the Forced Swim Test (FST) and Tail Suspension Test (TST), many standardized depression models were used. The findings of this study imply that *Griffonia simplicifolia* aqueous extracts may have antidepressant properties. [63]

Ximenia americana

The goal of the current investigation was to determine whether the hydroalcoholic extract of *Ximenia americana* has antioxidant and anti-depressant properties. A Tail Suspension Test was used to assess antidepressant activity showed that even when the extract was present, sodium fluoride decreased the body weight of the animals and greatly increased their inactive time, as well as the levels of malondialdehyde in their liver and brain. Malondialdehyde levels and animal inactivity time both considerably decreased when *Ximenia americana* hydro-alcoholic extract was present. [64]

Citrus maxima

The purpose of this study was to evaluate the antidepressant-like action of an aqueous extract from *Citrus maxima* (Rutaceae) leaves. The extraction of aqueous solutions was done by boiling. A mouse study on acute toxicity was carried out. Utilising the tail suspension test, modified forced swimming test, and locomotor activity test, antidepressant activity was investigated. In both the TST and FST, the immobility period was dramatically decreased by an aqueous extract of *Citrus maxima* leaves. It had psycho stimulant effects during tests of locomotor activity. Similar to the impact of imipramine, extract boosted the climbing behaviour in FST. [65]

PLANTS WITH SEDATIVE & HYPNOTIC ACTIVITY

Solanum torvum

A member of the Solanaceae family, *Solanum torvum* is a prickly, tomentose, 1.5–3 m tall shrub with lobed fruits perched on the calyx, white bell-shaped flowers, and leaves without prickles. The goal was to examine in albino mice the sedative and hypnotic effects of an ethanolic leaf extract of *Solanum*

torvum. The ethanolic extract of *Solanum torvum* increased sleep duration in a statistically significant way when hypnotic activity was assessed, but it had no effect on sleep start. ^[66]

Grewia asiatica

Grewia asiatica L (Malvaceae family). It is commonly referred to as Phalsa. The goal of the current experiment was to assess the methanolic extract of *Grewia asiatica* leaves for their acute toxicity test, antidepressant, and sedative-hypnotic properties. After viewing the Hole Board Test, sedative-hypnotic action was visible at doses of 100 and 200 mg/kg body weight. In Hole Cross and Open Field Tests, sedative-hypnotic activity with a brief duration of action was also present. ^[67]

Scoparia dulcis

Scoparia dulcis L (Family: Scrophulariaceae), sometimes known as sweet broom weed. Then, at dosages of 50, 100, and 200 mg/kg of EESD, the sedative and hypnotic activity was examined using the mouse hole cross, open field, hole-board, rota-rod, and thiopental sodium-induced sleeping time determination tests. All trials employed diazepam as a reference medication at a dose of 1 mg/kg. ^[68]

Justicia gendarussa

Southern India's riverbeds are home to a shrub known as *Justicia gendarussa* an evergreen scandent shrub from the Acanthaceae family that is also known as Vadaikkuthi in Tamil. Indian traditional medicine has employed *Justicia gendarussa* for its reviving, calming, and mood-enhancing effects. The goal of the current investigation was to assess the sedative - Hypnotic potential of the ethanolic extract of *Justicia gendarussa* (EJG) in mice using the Traction Test and Thiopental-Induced Sleep with Diazepam i.p. DZP (3 mg/kg) as a reference medication. ^[69]

Lavandula officinalis

The central nervous system's (CNS) sedative and hypnotic effects of a methanolic and aqueous extract of *Lavandula officinalis*. In this research, a variety of mouse behavioural models were used to examine the effects of methanolic and aqueous extracts of this plant. ^[70]

Myristica fragrans

Myristica fragrans (Family-Myristicaceae), whose dried seed kernel is known as nutmeg. The objective of this study is to assess in experimental animals the sedative and hypnotic effects of an aqueous extract of *Myristica fragrans* seeds. Male and female Wistar albino rats, as well as Swiss albino mice, are used in this preclinical study. Utilising the Hole Board Test, the Open Field apparatus, the rota rod apparatus, and thiopental-induced sleep time, sedative and hypnotic qualities were evaluated. ^[71]

Valeriana wallichii

A well-known Indian traditional medicine herb with a sleep aid is valerian. The perennial *Valeriana wallichii* (Tagara) herb grows at higher altitudes and belongs to the Valerianaceae family. The current investigation looked at the sedative and hypnotic effects of *Valeriana wallichii* ethanol root extract on mice. Then, mice were given EEVW (ethanolic extract of *Valeriana wallichii* roots) at doses of 50, 100, and 200mg/kg to examine the sedative and hypnotic activity utilising the Hole Cross, Open Field, Hole Board, and Rota Rod methods. All of the tests employed diazepam at a reference dose of 1 mg/kg. ^[72]

Lycopus europaeus

Lycopus europaeus methanolic extract's effects on the central nervous system were examined. Comparing the methanolic extract to the reference material, diazepam in hole board and thiopental-induced sleeping time procedures, the methanolic extract produced a substantial sedative effect at doses of 200, 400, and 600 mg/kg (via oral route). The reestablishment time and number of head dips during the traction and hole-board tests were both significantly decreased when the hypnotic effect was determined at doses of 800 and 1000 mg/kg via the oral channel. These findings support the use of *Lycopus europaeus* methanolic extract as a treatment for insomnia because it has strong sedative and hypnotic properties. ^[73]

Aronia melanocarpa

The Rosaceae family's woody shrub *Aronia melanocarpa* fruit juice is now widely planted not only in North America but also in Eastern Europe and Russia. *Aronia melanocarpa* fruit juice has undergone extensive research to determine its potential effects on the central nervous system. The purpose of the study was to examine any potential sedative-hypnotic effects of acute and subchronic administration of *Aronia melanocarpa* fruit juice in rats. Three oral doses of *Aronia melanocarpa* fruit juice (2.5, 5.0, and 10.0 ml/kg) were given to male Wistar rats either all at once (acute treatment) or over the course of 30 days (subchronic treatment). ^[74]

***Hemidesmus indicus* L**

The current study evaluated the sedative and hypnotic-like properties of the ethanolic and aqueous extracts of *Hemidesmus indicus* L Stem and Leaves. Thiopental sodium has been used to gauge the hypnotic effect. The loss of the righting reflex signalled the onset of sleep. Sleep latency and sleep duration were evaluated in the current study. ^[75]

CONCLUSION

In many areas, traditional medical knowledge provides intriguing directions for pharmacological research. We have gathered information on many different plant species that are traditionally used as remedies for neurological issues in this review. Based on these findings, further in-depth research on that particular species can be directed towards identifying the chemicals accountable for the noted bioactivities and unraveling their mechanisms of action. The information gathered in this review should help practitioners successfully apply their knowledge of medicinal plants and their bioactive byproducts to the treatment of CNS disorders. The review discussed how medicinal plants with effects on the central nervous system, such as anticonvulsants, antidepressants, treatments for Parkinson's disease, Alzheimer's disease and sedatives and hypnotics are potentially useful as sources of medications due to their efficacy and safety.

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