



# Medicinal uses of Plants for Nervous Disorders



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## Abstract

Use of plants for curing human ailments is an ancient practice. Recently there is revival of interest. Ethno botanical field surveys have been done from different parts of developing countries of the world. It reflects concern about the possible loss of valuable information on traditional medicine. Neurological disorders are often not considered common diseases. They are mental illness like epilepsy which is the most serious chronic disorder affecting millions of people. Other's like Parkinson's, Alzheimers, Meningitis and Stroke. Nervous disorders also affect speaking, movement, breathing, mood and memory. Herbal medicines are a holistic medium. Growing of these important herbs will add to the terrestrial diversity of the ecosystem and help in conservation of Biodiversity [1]. *Centella asiatica*, *Avena sativa*, *Lagenaria sicerana*, *Cassia tora*, *Cassia fistula* are some of the important plants used in nervous disorders. The different medicinal plant varieties can be studied with biochemical properties and a taxonomic classification can be made based on medicinal uses and on the biochemical relationship drawn. Tissue Culture studies along with molecular characterization can also be done. Important germplasm of the medicinal plants will add to the terrestrial biodiversity and the most effective medicinal plant used for nervous disorder can be obtained [2].

**Keywords:** Nervous disorders; Medicinal plants; Biodiversity; Ethnobotany; Mental illness

## Introduction

Most of the population depends on traditional medicine for primary health care, however, neurological disorders are often not considered as common diseases and many people with mental illnesses, like epilepsy, are severely affected by health related stigma and discrimination. Epilepsy is the most common serious chronic brain disorder, estimated to affect at least 10 million people. Others like Parkinson's, Alzheimers, Meningitis and Stroke. Nervous disorders also affect speaking, movement, breathing, mood and memory. Neurological disorders affect the brain and spinal cord [3].

Ethnomedicine and Ethno pharmacology can bring promising results capable of adding value to the very rich natural resources of the country [5]. Taking into account the existing knowledge on the medicinal properties of plants for treatment of neurologic disorders, it is believed that research in the areas of ethnomedicine and ethnopharmacology is required. Medicinal plants with properties of curing neurological disorder can be utilized for research in Ethnomedicine and Ethnopharmacology to help people suffering from nervous disorders [6].

Medicinal value present in tissues produces physiological action on body. Alkaloids (in the form of C,H,O,N), Glucosides, essential oils, fatty oils, mucilages, tannins, gums are present in the plants. Use of plants for curing human ailments is an ancient practice [7]. This work can help in identifying the active compounds

in many plants and mode of action can be identified. This can bring promising result. Recently there is a revival of interest. It reflects concern about possible loss of valuable information on traditional medicine. Quite a number of neurological activities of medicinal plants and mode of action has been studied. Most population depends on traditional medicine for primary health care, so study of medicinal herbs is essential [5]. Since the plants have ability to cure the disease the study will enhance the probability of getting the composition for the treatment.

## Review

### A total of 18 plant species has been reviewed

***Rauwolfia serpentine* L(Benth) ex Kurz:** In *Rauwolfia* the root is used in humans to treat hypertension and insanity. It is also used for relief of central nervous disorder including anxiety and excitement [8]. It is used for insomnia, mental disorders and aggressive behavior. It calms the central nervous system and reduces anxiety, irritability and aggression. It can be used for the treatment of schizophrenia, epilepsy, psychosis and other mental disorders [9]. It is found in the Eastern and Western Ghats. The important compounds present in the plant are deserpidine, indobine, reserpine and serpentine. *Rauwolfia serpentina* has immense therapeutic properties [10].

**Aegle marmelos L:** In *Aegle marmelos* various studies have shown the presence of flavonoids in phytochemical screening which are responsible for anxiolytic effect through benzodiazepine receptors. Therefore, flavonoids present in *Aegle marmelos* may be responsible for the anti-anxiety activity. Various studies on *Aegle marmelos* have shown presence of phyto constituents other than flavonoids like tannic acid, phenols, marmesinin, ascorbic acid, eugenol, skimmianine and saponin etc which may possess anxiolytic properties. *Aegle marmelos* can be a safe and effective drug for the treatment of number of anxiety disorders. The fruit contains ethanolic extracts. These are used to care fatigue, anxiety, depression. The fruit has steroids, coumarin and alkaloids. The country of location of this plant is Sri Lanka. The leaves also contain active compounds. Some of the active compounds are aegeline, furocoumarins, marmelosine. It has huge pharmaceutical potential [11].

**Rosmarinus officinalis L:** *Rosmarinus officinalis L.* has several therapeutic applications in folk medicine in curing or managing a wide range of diseases including depression. The model for this plant is that the extract of *R. officinalis* produced an antidepressant like effect, since the acute treatment of mice with the extract reduced the immobility time swimming test and tail suspension test in mice as compared to a control. The results which show the mode of action suggest that the anti depressant action of *R. officinalis* is mediated by an interaction with the monoaminergic system and that this plant should be further investigated as an alternative therapeutic approach for the treatment of depression [12]. (Daniele

Rosemary diterpenes have been shown in recent years to inhibit neuronal cell death induced by a variety of agents both *in vitro* and *in vivo*. The multifunctional nature of the compounds from the general antioxidant-mediated neuronal protection to other specific mechanisms including brain inflammation and amyloid beta formation is discussed. It is found in Africa. The active compounds include rosmarinic acid, betulinic acid and carnosic acid. Leaves of *Rosmarinus officinalis* and the flowers of *Lavandula officinalis* have been used as medicine for treatment of nervous disorders, in traditional Moroccan medicine [13-18]. We evaluate the central nervous system psychotropic effects of the essential oil from the leaves of *R. officinalis* and the flowers of *L. officinalis* using a battery of comportamental psychopharmacology tests. The essential oil extracted by hydrodistillation were characterized by means of GC-MS. *R. officinalis* contained  $\alpha$ -pinene (15.82%), camphene (6.80%),  $\beta$ -pinene (4.75%), myrcene (1.70%), p-cymene (2.16%), 1,8-cineole (50.49%), camphor (11.6%), borneol (2.58%), and borneol acetate (2.08%). However, lavender oil contains nine constituents, among which 1,8-cineole (5.30%), linalool (44.67%), camphor (6.02%) and linalyl acetate (42.00%) were identified. The intraperitoneal administration in mice of essential oil from *L. officinalis* at 300 and 600mg/kg i.p. induces strong sedative effects compared to reference substance diazepam in mice, and a hypnotic effects at doses 1000 and 1500mg/kg. However, the essential oil extracted from *R. officinalis* at the doses 50 and 100mg/kg, produced no sedative activity significant on the central nervous system (Table 1).

**Table 1:** Plants used in nervous disorders.

Family	Plant Species	Geographical Location	Part Used	Use of the Plant
Poaceae	<i>Avena sativa</i> L.	Eurasia, Africa	seeds	Nervous disorder
Rutaceae	<i>Aegle marmelos</i> L.	India, Sri Lanka	Bark, leaf, flower, fruit	Anxiety, depression
Acoraceae	<i>Acorus calamus</i> L.	Central Asia, Russia, Siberia	rhizome	Neuro protective
Solanaceae	<i>Datura metel</i> L.	North America	Seed, flower	Induce relaxation
Euphorbiaceae	<i>Embllica officinalis</i> L.	India	fruit	epilepsy
Convolvulaceae	<i>Evolvulus alsinoides</i> L.	East Asia	Whole plant	psychotropic
Apiaceae	<i>Ferula asafoetida</i> L.	Iran	Gum, resin	epilepsy
Caprifoliaceae	<i>Valeriana</i>	Europe	root	sedative
Annonaceae	<i>Annona squamosa</i> L.	America	fruit	depression
Plantaginaceae	<i>Bacopa monieri</i> L. (Pennel)	Eastern India	Whole plant	insanity
Anacardiaceae	<i>Anacardium occidentale</i> L.	India	Fruit, seeds, leaf	insanity
Annonaceae	<i>Annona muricata</i> L.	Cuba	leaves	sedative
Oxalidaceae	<i>Biophytum sensitivum</i> L. (DC)	Nepal	leaflets	insomnia
Caesalpinaceae	<i>Cassia occidentalis</i> L. (Link)	South East Asia	Fruit pulp	hysteria
Caesalpinaceae	<i>Cassia fistula</i> L.	South East Asia	Fruit pulp	epilepsy
Papaveraceae	<i>Papaver somniferum</i> L.	Europe	seeds	narcotic
Loganiaceae	<i>Strychnos nux vomica</i> L.	South East Asia	seeds	paralysis
Family	Plant species	Geographical location	Part used	Use
Solanaceae	<i>Hyoscyamus niger</i> L.	Europe	Leaves, flower tops, seeds	hypnotic

Araliaceae	Panax ginseng Oken	Russia	root	stimulant
Ranunculaceae	Aconitum napellus L.	Europe	seeds	neuralgia
Loranthaceae	Loranthus longifera Jacq.	Africa	Aqueous extract	Increases brain power
Apocyanaceae	Rauwolfia serpentina L. (Benth)ex Kurz.	Eastern and Western Ghats	root	anxiety

***Evolvulus alsinoides L.*** Bioactivity guided purification of n-BuOH soluble fraction from two new compounds, 2,3,4-trihydroxy-3-methylbutyl 3-2 propeonate and 1,3-di-O-caffeoyl quinic acid methyl ester along with 6 known compounds, caffeic acid, 6-methoxy-7-O-beta-glucopyranoside coumarin, 2-C-methyl erythritol, kaempferol-7-O-beta-glucopyranoside. The structure of new compounds were elucidated by spectroscopic analysis, while known compounds were confirmed by direct comparison of their NMR data with those reported in literature. This is the first report of the presence of phenolic constituents in *Evolvulus alsinoides* [12]. *Evolvulus* is effective nootropic agent, it is mainly indicated in loss of memory, sleeplessness, treatment of epilepsy. (Anupama, 2016). The isolated compounds were screened for anti stress activity in acute stress induced biochemical changes in adult male Sprague-Dawley rats. Stress exposure has resulted in significant increase of plasma glucose, adrenal gland weight, plasma creatine kinase and corticosterone levels. The compounds displayed most promising antistress effect by normalizing hyperglycemia, plasma corticosterone and adrenal hypertrophy. It is found in East Asia. The whole plant is used for medicinal purpose. The compounds present in it are scopoletin, umbelliferone and scopolin. The chemical structure is 2-methyl-1,2,3,4-butanetetrol. *Evolvulus alsinoides* (EAE) extract exhibited a positive stimulatory effect on the cholinergic system in all groups of rats in general and AD-induced rats in particular [19-22].

***Avena sativa L.*** *Avena sativa* is mainly used for spasmodic and nervous disorders with exhaustion. Cardiac weakness, spermatorrhea problem, the nervous debility of convalescence is common symptoms of homeopathic *Avena sativa*. (Shastho Totho) In male function neurasthenia, homeopathic *Avena sativa* has a selective influence upon the nerve system of the genitor-urinary apparatus. Because of its selective power upon the total nervous structure which supplies the reproductive organs. Nervous palpitation of the heart, insomnia, nervous excitement and mental weakness or failure and general debility caused by masturbation can be easily removed using this remedy. It is found in Europe. The whole plant and seed is important. The chemical constituents are alkaloids, amino acid and ascorbic acid [23].

***Datura metel L.*** Producing and selecting interspecific hybrids of *Datura* for high scopolamine production was successfully done. The leaves of *Datura metel* contain 0.2-0.5% tropane alkaloids, the flowers 0.1-1.0% and the seeds 0.2-0.5%. Scopolamine is major constituent in mature leaves. Other alkaloids are hyoscyamine, norhyoscyamine, norscopolamine, hydroxyl-6-hyoscyamine and metelodine. They increase the heart rate, induce relaxation and motor inhibition in smooth muscles, decrease secretions and induce

dilation of the pupils of the eyes. *In vitro* production of scopolamine and hyoscyamine is feasible though uneconomical. Cultures of hairy roots of *Datura metel* are the most productive. (Plant Resources of Tropical Africa). It is found in India. The leaf is used for medicinal purpose. It contains tropane alkaloids, hyoscyamine and atropine [24].

***Annonasquamosa L.*** Some neuropharmacological are there in effects of the ethanol extract of the leaves of *Annona diversifolia*. Intraperitoneal administration of the extract delayed the onset of clonic seizures induced by pentylenetetrazole and delayed the time in the rota-red and swimming test. In addition the extract augmented the duration of sleeping time induced by sodium pentobarbital. These results indicate that the ethanol extract of the leaves of *A. diversifolia* has depressant activity on the central nervous system [25]. It is found in Cuba. The active constituent is annonacin.

***Acorus calamus L.*** Chewing the rootstock of *Acorus calamus* plant can cause visual hallucinations, possibly because of the presence of alpha-asarone or beta-asarone. *Acorus calamus* shows neuroprotective effect against stroke and chemically induced neurodegeneration in rats. Specifically, it has protective effect against acrylamide-induced neurotoxicity. Both roots and leaves of *Acorus calamus* have shown antioxidant properties. *Acorus calamus* roots and rhizomes have been used in Indian system of traditional medicine for hundreds of years and it is highly valued as a rejuvenator for the brain and nervous system. *Acorus calamus* rhizome constituents, particularly alpha and beta asarone possess a wide range of pharmacological activities such as sedative, CNS depressant, behavior modifying, anticonvulsant, acetyl cholinesterase inhibitory and memory enhancing. It is found in Central Asia. The leaves stem and roots are used. The chemical constituents are alpha asarone, beta asarone and eugenol [26].

***Bacopa monnieri L (Pennel)***: Several studies have suggested that *Bacopa monnieri* extracts have protective effects in animal models of neurodegeneration. The herbal supplement and extract has effect on memory, anxiety and brain health. It is also used for epilepsy, nootropic substances, Alzheimer's disease and memory improvement. It helps in anxiety reduction, attention deficit hyperactivity disorders. The whole plant standardized dry extract has role on cognitive function and affects its safety and tolerability in healthy elderly study participants. The study provides further evidence that it has potential for safely enhancing cognitive performance in the aging [27]. It increases the cerebral blood flow. It is found in Eastern India. The active constituents are triterpenoid, saponins and bacosides.

***Ferula asafoetida L.:*** The oleo gum resin of *Ferula asafoetida* has recently found to have neuroprotective properties in animal models and humans. (Asma K,2015). Asafoetida has been used as a sedative and stimulant. It is widely used in Indian system of medicine like Ayurveda. Asafoetida has been held in great esteem among indigenous medicines, particularly in Unani system [28,29]. It is found in Nepal and Saudi Arabia. The dried latex, rhizome and root is used. It was tested orally on albino rats and mice and increased life span by 52.9%. The active constituents are carbohydrate and ferulic acid.

***Embilica officinalis L.:*** *Embilica officinalis* is helpful in the following health conditions: Memory loss, mental fatigue, anxiety with mental irritability and restlessness, depression with aggressive reactions, attention deficit hyperactivity disorder. Amla is helpful in following health conditions; Brain and nerves-headache with burning sensation, migraine with pulsing and throbbing pain, memory loss, mental fatigue, vertigo. Psychological diseases-anxiety with mental irritability and restlessness, depression with aggressive reactions, insomnia, violent mental agitation. The dried and fresh fruit is used. It enhances intellect. The active compounds are embilicannin, ascorbic acid, polyphenols and gallic acid.

***Valeriana:*** *Valerian* extract can cause sedation by increasing brain's GABA level. GABA is an inhibitory neurotransmitter, and in large enough quantities it can cause a sedative effect. Results from an *in vitro* study suggest that *Valerian* extract may cause GABA to be released from brain nerve endings and then block GABA from being taken back into nerve cells. In addition Valeran's valerenic acid inhibits an enzyme that destroys GABA another way that *Valerian* can improve your GABA levels and promote a great night's rest. Scientists have found that *Valerian* root increases the amount of a chemical called gamma aminobutyric acid (GABA) in the brain. GABA helps regulate nerve cells and calms anxiety [30]. Drugs such as alprazolam and diazepam also work by increasing the amount of GABA in the brain. The valerenic acid and valerenol contained in *Valerian* root extract act as anti-anxiety agents. It's pretty amazing that a herbal remedy like *Valerian* root can have the same anti-anxiety effects of prescription drugs without all the serious side effects of psychotropic drugs. *Valeriana* root have sedative and anxiolytic effects. The root is used. It is found in North America. It stimulates serotonin receptors. The active compounds are Isovaleric acid and hesperidin.

***Cassia occidentalis L.(Link):*** Study evaluated the effect of *Cassia fistula* on sleeping time and level of anxiety in male albino mice. The aqueous extract of fruit increased sleeping time and decreased levels of anxiety in mice. Investigations have revealed several biological activities such as antidepressant activities of *Cassia occidentalis*. Leaf poultices of *Cassia fistula* are also used for fascial massage in affections of the brain and applied externally in paralysis, rheumatism and gout. It is found in East Asia. The buds and dried unripe fruits are used [31].

***Papaver somniferum L.:*** *Papaver somniferum* is the species of plant from which opium and poppy seeds are derived. It is the

source of natural and semi synthetic narcotics. It is the source of several pharmaceutical benzylisoquinoline alkaloids including morphine, codeine and sanguinarine. The hairy root cultures accumulated three times more codeine than intact roots. Narcotics are used therapeutically to treat pain but they alter mood and behavior significantly. 2 enzymes and their genes are involved in mode of action. It is found in Mediterranean region. The active compounds are papaverine, noscapine and oripavine [32].

***Strychnos nuxvomica L.:*** *Nuxvomica* is a plant. The seed is used to make medicine. It is used for nerve conditions and depression. *Nuxvomica* dried seeds contains two principles alkaloids-Strychnia and Brucia. It is useful for people doing mental work or under stress. It is found in South East Asia. The bark is used. The active compound is brucine [33].

***Hyoscyamus nigerL.:*** The Application areas of *Hyoscyamus niger* are epilepsy, meningitis and dementia. *Hyoscyamus* is a remedy with some common mental and emotional themes running through all its various expressions [34]. It is found in Europe. It is a sedative and analgesic. The active compounds are hyoscyamine, scopolamine and tropane alkaloids.

***Panax ginseng Oken:*** The root of *Panax ginseng* has been a popular medicine. Ginsenosides are neuroprotective. This review considers publications dealing with the various actions of *P.ginseng* that are indicative of possible neurotherapeutic efficacies in neurodegenerative diseases and neurological disorders such as Parkinsons disease, Alzhemirs disease, Huntingtons disease and amyotrophic lateral sclerosis and multiple sclerosis. *Ginseng* has been used as a traditional modern medicine for over 2000 years and is recrded to have antianxiety, antidepressant and cognition enhancing properties. The molecular mechanisms of the neuroprotective effects of *ginseng* in Alzhemirs disease including beta amyloid formation, major depression and Parkinson's disease is discussed. It is found in Russia and Korea. It has multivitamins [35].

***Aconitum:*** *Aconite* is one of the best remedies for waves of fear or outright panic. It is wild in alpine Himalayas of Kashmir and Nepal at an altitude of about 3600m. Root is used for nervous disorders, neuralgins, dropsy and as sedative. Pure roots contain the alkaloids pseudoaconitine, chasmaconitine, indaconitine and bikhaconitine. The efficacy of the drug is based on the di-ester alkaloids-aconitin, mesaconitin and hypaconitin [36].

***Loranthus longifolia Jacq.:*** *Loranthus longifolia* protects central nervous system against electromagnetic radiation on rat. It has been widely used for the treatment of brain diseases, particularly in South West China. Hence, the present neuroprotection model was designed to investigate its neuroprotective properties against hydrogen peroxide induced oxidative stress in NG-108-15 cells. The aqueous extract exerts marked neuroprotective activity. It has steroids, alkaloids, flavonoids and phytochemicals. It is found in Africa. *Loranthus* on scopolamine induced memory impairment in mice [37].

## Discussion

Several medicinal plants have been identified having properties for dealing with nervous disorders. *Aegle marmelos* can be a safe and effective drug for anxiolytic effects. The fruit contains the ethanolic extracts. The fruit has steroids and alkaloids. There is need to further study the antidepressant action of *Rosmarinus officinalis*, the rosemary diterpenes have shown to inhibit neuronal cell death. Compounds have been reported from *Evolvulus alsinoides* which are most promising in antistress effect by normalizing hyperglycemia, plasma corticosterone and adrenal hypertrophy. Hybrids of *Datura metel* have high scopolamine production which increases heart rate and induces relaxation in muscles and the *in vitro* production of scopolamine is feasible, as hairy roots of *Datura metel* are the most productive [38].

Further work on *Acorus calamus* needs to be done as leaves which show antioxidant properties and has neuroprotective effect. The whole plant dry extract of *Bacopa monnieri* has a role on cognitive function and is tolerable in elderly patients. *Ferula asafoetida* is neuroprotective and an indigenous medicine in Unani and Ayurveda, which is used in household always. The molecular characterization work still needs to be done on *Embilica officinalis* which is helpful for violent mental agitation. The GABA action of *Valeriana* roots without any side effects and used as a psychotropic drug. The important fact of *Papaver somniferum* for mood swings is that hairy root cultures have three times more codeine than intact roots. Ginseng has been used for more than 2000 years and is useful as antianxiety, anti depressant and in Parkinson's disease. The pure roots of Aconite contain the alkaloids for fear and panic. *Loranthus* is neuroprotective against hydrogen peroxide induced oxidative stress [39].

## Conclusion

Certain genera like Cassia may be of value in conservation of drug plant resources. Further identification of medicinal plants through such classification might help in drug formulations, drug substitution and for systemizing our knowledge about medicinal plants. Family wise and disease wise break up of drug plants would systematize the survey and structure based grouping of useful plants. Geographical regions of the world likely to yield useful information on disease incidence/distribution and variation of the pattern of plant use, diversity of a plant species is proportional to its medicinal use. Medicinal value present in tissues produces physiological action on body. Alkaloids and glucosides can be used [40]. Different plant varieties to be studied with biochemical parameters and a taxonomic classification can be made based on medicinal uses and on the biochemical relationship drawn. Tissue culture studies and molecular characterization of all the species are to be done. Important germplasm of the above mentioned plants will add to the terrestrial biodiversity and the most effective medicinal plant used for nervous disorder can be obtained. The active compounds will be studied on model animals and their

efficacy in a combined way can lead to better future studies and prospects.

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