ISSN: 0976-7126
Parmar *et al.*, 13(5):15-21, 2022

International Journal of Pharmacy & Life Sciences
Open Access to Researcher

A Review on Central Nervous System Activity of some Indigenous Medicinal Plants

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Article info

Received: 01/04/2022

Revised: 21/04/2022

Accepted: 28/05/2022

www.ijplsjournal.com

Abstract

Plants have always been the principle source of medicine in India and world since ancient past and presently they are becoming popular throughout the developed countries. Herbs play an important role in the lives of tribal and rural people, particularly in remote part of developing countries. Obviously, these plants help in alleviating human suffering. The indigenous method of preparation maintains the purity of the drug. Furthermore, traditional folk healers treat with kindness, grace, patience and tolerance, which play a vital role in healing process today. The present review was aimed to elaborate the pharmacological screening of some indigenous plants for CNS activities.

Key words: CNS, Medicinal Plants, Pharmacology

Introduction

Indigenous plants are plants that are native to a particular area. India has many indigenous species that which are found only in various parts of the country. It is important to protect indigenous species because they have often evolved to cope with particular conditions, circumstances or situations. There are many indigenous species that have been found to contain unique properties, which have been used to develop specialized drugs, which have saved thousands of lives. Once indigenous plants become extinct, they are lost forever. Indigenous plants are the natural inhabitants of the region, that is to say they are the naturally occurring plants found in this part of India. There are a number of alternative names for indigenous plants including local native plants or Indian native plants from our local area. [1-3]

The human brain is the single most important organ of the human nervous system. Humans and other species are distinguished by the functions of their brain and physiology. Disorders of the brain's function (insomnia, anxiety, epilepsy, depression, schizophrenia) are the major concern of human society. According to world health organization "health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity", it is also suggested that there is no health without mental health. Sixty to seventy million people in India have been suffering from mild to severe mental disorders and treatment has been given for their condition. From different literatures it is estimated that 22% of individual having one or more mental or behavioural disorders associated during their life time. [4-5]

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Among all the diseases of human being, it is estimated that approximately 12% of psychiatric disorders are the global disease burden in now a days. It is assumed that it may likely to be increase up to 15% by 2020. It is also said that the progress rate of mental illness by 2025 may be catched up with heart disease or may even cross the figure. Since it is considered as the biggest global health concern. [6-7]

Pharmacological Activities on CNS

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 desperpidine, indobine, reserpine and serpentine. Rauvolfia 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 swimmining 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 GCMS. R. officinalis contained α-pinene (15.82%), camphene (6.80%), β-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 intraperitonial 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).

Evolvulus alsinoides L.: Bioactivity guided purification of n-BuoH solube fraction from two new compounds, 2,3,4-trihydroxy3methylbutyl 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 coumarine, 2-C-methyl erythritol, kaemferol-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 promosing 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 arescopoletin, 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. Becuase 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, decreade 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 Resouces of Tropical Africa).It is found in India. The leaf is used for medicinal purpose. It contains tropane alkaloids, hyoscyamine and atropine [24].

Annona squamosa 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 petylenetetrazole and delayed the time in the rota-red and swimmimng test. In sddition the extract augmented the duration of sleeping time induced by sodium pentobarbital. These results indicate that the ethanol extract of the leaves of A. diversifoloia has depressant activity on the central nervous system [25]. It is found in Cuba. The active constituent is annonacin.

Acoros 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 neurodegenaration 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 diseasesanxiety 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 embillicannin, 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 alpazolam 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 nux vomica L.:Nux vomica is a plant. The seed is used to make medicine. It is used for nerve conditions and depression. Nux vomica 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 niger*** L.: The Application areas of Hyocyamus 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 pseudaconitinine, 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].

Conclusion

Herbal medicines for CNS disorders are a centuries-old practiced medical form in diversified cultures. The herbal medical traditions are reported in China, Iran, Europe, America. Chinese herbal medicine, which is significantly different from others, is time-honored tradition and based on sophisticated medical theories under-going long-term repeated confirmation. Besides, the quantity of the herbs for CNS disorders in Chinese traditional herbal medicine is absolutely dominant in herbalism worldwide. Herbal medications are currently the most usual approach to complementary and alternative medications, which play an important part in the therapy to control CNS disorders.

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Cite this article as:
Parmar H., Gupta S.K. and Shrivastava S.K. (2022). A Review on Central Nervous Activity of some Indigenous Medicinal Plants. *Int. J. of Pharm. & Life Sci.,* 13(5): 15-21.

Source of Support: Nil
Conflict of Interest: Not declared
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