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Review Article

A Review on Some Medicinal Plants of North- East India Region Used in the Treatment of Central Nervous System Disorders

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Abstract

Background: Central nervous system (CNS) disorders are a group of neurological disorders concerned with behaviour, coordination and functioning of the brain and the spinal cord. The CNS is the site of processing various informations. It interprets and evaluates the information and as result, the CNS responds accordingly and controls the body. Any defects or disorders of the Central nervous system may cause degeneration of the organs and tissues associated with it, loss of coordination, paralysis, etc. These disorders may be hereditary or due to injuries to the brain and spinal cord. Although, these disorders are being cured with medicaments, many plant species are also seen to be effective in its treatment. **Objective:** the main objective of this article is to underline the potentials and the needs for the documentation of the ecological knowledge of herbal medicines of the north east India region, necessary for the greater well-being of mankind in the prevention and cure of CNS disorders. **Methods**: an extensive literature survey was carried out through various databases like Google Scholar, Pubmed, Sciencedirect etc to support this review. All the collected information was analyzed accordingly and the plants were enlisted based on the classes of CNS disorders for which they are used. **Result and discussion:** from the survey of the database being collected, it was found that many traditional and local plants of the northeast India region are therapeutically effective in the treatment and cure of many Central nervous system disorders**. Conclusion:** It is now an accepted fact that many traditional plants found in the Northeast India have been acceptable within the human body and hence these can be used to replace many expensive medications available in the market.

Keywords: Medicinal plants; Central Nervous System; CNS disorders; Northeast India; Plant extract

INTRODUCTION

The Central Nervous System (CNS) is one of the major divisions of the Nervous System consisting of the brain and the spinal cord. When examined by physiologists and anatomists, it was found to be playing a very major role in our body's function. It co-relates information from different parts of the body and coordinates activities across the entire human framework. The CNS controls many functions in our body. For example it controls our thoughts, emotions, body movements, behaviour, mood, appetite, desires, body temperature, release of hormones and much more. [1]

Central nervous system (CNS) disorder is a general class of conditions where the brain does not function or work as it should have, restricting the wellbeing and the capacity to work. The condition might be an acquired metabolic issue; the latter effect of harm from a disease, a degenerative condition, stroke, a brain tumour or other issues; or emerge from obscure or multiple factors. Movement disorders, for example, Parkinson's disease, dystonia and other basic tremor are conditions reflected by the CNS. What they share practically speaking is the loss of adequate, intact nervous system circuits that arrange capacities as fluctuated as memory development (in Alzheimer's) or voluntary movement (in movement disorders). While most conditions in this gathering cannot be totally restored, symptoms of central nervous system illness can often be managed through a range of therapies, from clinical to surgical treatment. Although, not many medications are as of now endorsed by administrative experts for treating these disorders, for example, Alzheimer's disease.

Use of plants for curing ailments is an ancient old practice. Even today, most of the population still depends on the traditional medicine therapy for primary well being .CNS disorders that are seen by an impact on activities essentially associated with the CNS are thought of. CNS functions such as cognition, alertness, memory sedation, etc can be considered as targets for treatment with plants and their constituents. As the activity of a plant or its extract depends generally on its chemical constituents, the majority of plants affect the CNS by providing compounds that act in the same, or opposite, way as the chemical transmitters found in the brain, which accelerates or inhibits the chemical transformations in the CNS. Hence, the herbal treatment ensures the CNS directly or indirectly against harmful chemicals or processes [2]. The Indian traditional system of medicine, Ayurveda, which is over 5000 years old, chosen plants have for some time been named 'medhyarasayanas',

from the Sanskrit words 'medhya', which means intellect or cognition and 'rasayana', signifying 'revival'.[3-6]

However, an aim to audit some of the most significant restorative plants found in the northeast region of India, including *Ginkgo biloba*, *Bacopamonniera*, *Hydrocotyle asiatica*, etc., which are generally utilized for their presumed adequacy in CNS disorders are seen here.

MATERIALS AND METHODS

In order to collect the data provided which support this review article, we performed an extensive literature survey of abstracts from 1999-2020. A systematic review using Sciencedirect, Scopus, Pubmed, Google and MEDLINE database is performed.

All English-language articles published between 1999-2019 were searched using the terms 'Medicinal plants', ' Northeast region plants', 'CNS Disorders', 'Plant extract', 'traditional uses of medicinal plants'. Evidence for the support of an extract was assessed from multiple studies. In this article, we have summarized and offered comments about the selected area and also identified some relevant changes and included some additional information that will assist and better understanding of the current state of medicinal care offered by some important plant species.

TABLE: Medicinal plants of North- East India region used for the treatment of CNS disorder

CATEGORY A: ***Medicinal plants used for the treatment of Epilepsy***

S. No.	Name of the plant	Parts of the plant used	Forms and Preparation	Ref
1.	***Acorus calamus*** L., (Acoraceae)	Roots and leaves	Roots and leaf decoction is used for the treatment	[7]
2.	***Annona squamosa***L., (Annonaceae)	Seeds	The smoke of burning seeds is inhaled for the treatment	[8]
3.	***Benincasa hispida*** (Cucurbitaceae)	Fruits	It is also given orally in epilepsy and other nervous disorders.	[8]
4.	***Eryngium foetidum*** L. (Apiaceae),	Leaves	It is given to patient of epilepsy to smell the leaf paste	[7]
5.	***Sapindus mukorossi***Gaertn. (Sapindaceae);	Fruits	Fruits are crushed to paste and mixed thoroughly with water (30 ml). It is taken orally (20 ml daily, before food) in the treatment.	[9]
6.	***Taxus baccata***Linn. (Taxaceae)	Leaves	Leaf extract are used in the treatment of epilepsy.	[9]
7.	***Vitex negundo***Linn. (lamiaceae);	Root bark	Root bark is ground and mixed with local liquor to make a paste. The paste is applied over neck in the treatment.	[9]

CATEGORY B: ***Medicinal plants used for the treatment of Convulsions/Seizures***

S. No.	Name of the plant	Parts of the plant used	Forms and Preparation	Ref
1.	***AnanascomosusMerr.***(Bromeliaceae)	Fruits and Leaves	The juice of the fruit and of leaves is given orally in the treatment of convulsions.	[8]
2.	***Eryngium foetidum L.***(Apiaceae)	Leaves	It is also used orally to stop convulsions during high fever.	[8]
3.	***Helicia excelsa Bl.*** (Proteaceae)	Seeds	A necklace is prepared with seeds and worn around the neck as an effective remedy in convulsions.	[8]
4.	***Ensete superbum*** (Musaceae)	Arial part	The exudates (2-5 ml) is given orally (2-3 times daily) in the treatment of convulsion. The latex of the inflorescence is taken orally in convulsions.	[8]
5.	***Artemisia vulgaris*** (Asteraceae)	Leaves	A soft moist mass leaves kept in place with a cloth and applied to reduce inflammation	[20]
6.	***Matricaria chamomilla*L.** (Asteraceae)	Plant extract	220-1110 mg of the plant extract daily for 8 weeks can be beneficial.	[24]

CATEGORY C: ***Medicinal plants used for the treatment of Alzheimer disease***

S. No.	Name of the plant	Parts of the plant used	Forms and Preparation	Ref
1.	***Curcuma longa*L.** (Zingiberaceae)	Root	A small dose of the root extract is given and then eventually increasing t to 500- 2000mg per day mixed with black pepper extract.	[10] [13]
2.	***Bacopa monnieri* (L.) Wettst.** (Scrophulariaceae)	Leaves and Stems	T he extract is taken orally for upto 12 weeks.	[15], [18], [19]
3.	***Hydrocotyle asiatica*** ***(***Apiaceae)	Extract	60-180 mg of golu kola extract daily to be used.	[21], [22], [23]
4.	***Gingko biloba*** (Ginkgoaceae)	Leaves	120 -600 mg of leaf extract is taken orally two times daily.	[25]
5.	***Camellia sinensis*** **(L.) Kuntze** (Theacae)	Extract	the extract from the plant part can be used to make tea with water by the process of ebullition. 1-3 cups or 60mg on regular basis is used.	[26]
6.	***Celastrus paniculatus* Willd.** (Celastraceae)	Seeds	Oil is extracted from the seeds and the sedative effect.	[30]
7.	***Allium sativum*** (Amaryllidaceae)	Bulb	Eating raw garlic on empty stomach helps to counteract age-related- changes in gut bacteria associated with the memory loss	[41], [42], [43], [44]
8.	***Phyllanthus emblica* L.** (phyllanthaceae)	Extract	The extract of the fruit are given to the Alzheimer patient	[38]
9.	***Crocus sativus* L.** (Iridaceae)	The dried stigmas	30mg of the dried stigma extract is used daily for 22 weeks	[33]

CATEGORY D: ***Medicinal plants used for the treatment of depression***

S. No.	Name of the plant	Parts of the plant used	Forms and Preparation	Ref
1.	***Valeriana officinalis* L.** (Caprifoliaceae)	Extract	60-180 mg of golu kola extract daily to be used.	[20]
2.	***Bacopa* monnieri (L.) Wettst.** (Scrophulariaceae)	Leaves and Stems	the extract is taken orally for upto 12 weeks.	[17]
3.	***Ocimum tenuiflorum*** (Lamiaceae)	Leaves	10-12 leaves are added in 2 cups of water and then ebullition takes place and it is reduced till half a cup. It is allowed to cool at room temperature and then strained and 1 teaspoon of honey is added to it.	[34]
4.	***Crocus sativus* L.** (Iridaceae)	The dried stigmas	30 mg of saffron extract or 100 mg of saffron daily upto 12 weeks.	[33]
5.	***Curcuma longa*L.** (Zingiberaceae)	Stem	500mg of curcumin , a chemical in turmeric, has been taken twice daily, alone or along with 20mg of fluoxetine daily, for 6-8 weeks.	[11], [12], [13]
6.	***Marsilea minuta*** (Marsileaceae)	Leaves	Fresh leaf decoction is taken twice a day for 10-12 days.	[39]

CATEGORY E: ***Medicinal plants used for the treatment of anxiety***

S. No.	Name of the plant	Parts of the plant used	Forms and Preparation	Ref
1.	***Mentha x piperita*** (Lamiaceae)	Oil and extract	The patients are given aromatherapy with peppermint essence and distilled water. Upto 1200mg of peppermint oil ia also found beneficial.	[40]
2.	***Aloe barbadensis*** **Mill.** (Asphodelaceae)	Extract	The extract is consumed directly for betterment.	[27]
3.	***Coriandrum sativum*****L.** (Apiaceae)	Leaf	The extract from the plant part of 100-200 mg/kg produces anti anxiety effects on the patients.	[35] [36]
4.	***Valeriana officinalis*****L.** (Caprifoliaceae)	Extract	60-180 mg of golu kola extract daily to be used.	[20]
5.	***Passiflora Incarnate*** (Passifloraceae)	Arial part	Capsules containing 400mg of passionflower extract twice daily for 2-8 weeks can be used. Also, 45 drops of a liquid extract of passion flower has been used daily for upto one month.	[48]
6.	***Crocus sativus*** **L.** (Iridaceae)	The dried stigmas	30 mg of saffron extract or 100 mg of saffron daily upto 12 weeks.	[33]
7.	***Bacopamonnieri*** **(L.) Wettst.** (Scrophulariaceae)	Leaves and Stems	The extract is taken orally for upto 12 weeks.	[15], [16], [17]
8.	***Withania Somnifera*****(L.) Dunal** (Solanaceae)	Roots	500- 600mg per day for 6-12 weeks	[37]

CATEGORY F: ***Medicinal plants used for the treatment of paralytic disorders***

S. No.	Name of the plant	Parts of the plant used	Forms and Preparation	Ref
1.	***Acorus calamus L.,*** (Araceae)	Roots and Leaves	Leaf decoction is taken daily in case of paralysis. Decoction of underground plant part is fomented on the body of a paralytic patient**.**	[31] [32]
2.	***Gaultheria fragrantissima Wall.*** (Ericaceae)	Leaves	Leaf juice of Gaultheria fragrantissima Wall, Clerodendron colebrookianum Walp. and Eucalyptus maculata Hook. is massaged over the body of persons suffering from paralysis	[49]
3.	***Phrynium pubinerve Blume.,*** (Marantaceae)	Rhizome	Plant rhizome along with mature leaves of Zanthoxylum acanthopodium DC., Pteridium aquilinum rhizome, Sarcandra glabra (Thunb.) Nakai. Leaves and. ***Phrynium pubinerve Blume.*** leaves are mixed together and ground. The fine mixture is then wrapped into many small packets with Phrynium pubinerve Bl. leaf and the packets are heated in the fire covered with ash so that they do not get burnt. After half an hour all the packets are taken out while it is hot and the contents of each packet is emptied into a piece of white cloth and tied at one end. It is then fomented on the body of persons suffering from paralytic conditions.	[49]
4.	***Piper longum L.*** (Piperaceae)	Roots	The root decoction (5-20 ml, 2-5 times daily) is taken orally in the treatment of paralytic conditions.	[49]
5.	***Persicaria nepalensis*** (Polygonaceae)	Rhizome	Plant rhizome along with mature leaves of Zanthoxylum acanthopodium DC., Pteridium aquilinum rhizome, Sarcandra glabra (Thunb.) Nakai. Leaves and *persicaria nepalensis* . Leaves are mixed together and ground. The fine mixture is then wrapped into many small Herbal remedies among the traditional folks in Meghalaya. Packets with *Phrynium pubinerve* Bl. leaf and the packets are heated in the fire covered with ash so that they do not get burnt. After	[49]

			half an hour all the packets are taken out while it is hot and the contents of each packet is emptied into a piece of white cloth and tied at one end. It is then fomented on the body of persons suffering from paralytic conditions.	
6.	***Polygonatum oppositifolium Royle.,*** (Liliaceae)	Rhizome	Plant rhizome along with mature leaves of Zanthoxylum acanthopodium DC., Pteridium aquilinum rhizome, Sarcandra glabra (Thunb.) Nakai. leaves and ***Phrynium pubinerve Blume.*** leaves are mixed together and ground. The fine mixture is then wrapped into many small packets with Phrynium pubinerve Bl. leaf and the packets are heated in the fire covered with ash so that they do not get burnt. After half an hour all the packets are taken out while it is hot and the contents of each packet is emptied into a piece of white cloth and tied at one end. It is then fomented on the body of persons suffering from paralytic conditions.	[49]
7.	***Pteridium aquilinum (L.) Kuhn ex Decken*** (Polypodiaceae)	Rhizome	Plant rhizome alongwith mature leaves of Zanthoxylum acanthopodium DC., Pteridium aquilinum rhizome, Sarcandra glabra (Thunb.) Nakai. leaves and Polygonum alatum Spreng. leaves are mixed together and ground. The fine mixture is then wrapped into many small packets with Phrynium pubinerve Bl. leaf and the packets are heated in the fire covered with ash so that they do not get burnt. After half an hour all the packets are taken out while it is hot and the contents of each packet is emptied into a piece of white cloth and tied at one end. It is then fomented on the body of persons suffering from paralytic conditions.	[49]
8.	***Zanthoxylum acanthopodium DC.*** (Rutaceae)	Rhizome	Plant rhizome alongwith mature leaves of Zanthoxylum acanthopodium DC., Pteridium aquilinum rhizome, Sarcandra glabra (Thunb.) Nakai. leaves and Polygonum alatum Spreng. leaves are mixed together and ground. The fine mixture is then wrapped into many small packets with Phrynium pubinerve Bl. leaf and the packets are heated in the fire covered with ash so that they d onot get burnt. After half an hour all the packets are taken out while it is hot and the contents of each packet is emptied into a piece of white cloth and tied at one end. It is then fomented on the body of persons suffering from paralytic conditions.	[49]

G: ***Medicinal plants used for the treatment of Parkinson's disease***

S. No.	Name of the plant	Parts of the plant used	Forms and Preparation	Ref
1.	***Mucuna prurienes*** (Fabacea)	Seeds	5g of *Mucuna prurienes* dried seed powder has been used on daily basis.	[50]
2.	***Curcuma longa*L.** (Zingiberaceae)	Stem	Starting with a lower dose of the extract and then eventually increasing t to 500- 2000mg per day mixed with black pepper extract.	[10], [13]
3.	***Withania somnifera*** (Solanaceae)	Roots	125mg -5g for 1-3 months have been beneficial	[37]
4.	***Bacopa monnieri*(L.) Wettst** (Scrophulariaceae)	Leaves and Stems	the extract is taken orally for upto 12 weeks.	[[15]
5.	***Camellia sinensis* (L.) Kuntze** (Theacae)	Extract	the extract from the plant part can be used to make tea with water by the process of ebullition. 1-3 cups or 60mg on regular basis is used.	[26]
6.	***Hydrocotyle asiatica*** ***(***Apiaceae)	Extract	60-180 mg of golu kola extract daily to be used.	[21], [22], [23]

CATEGORY H: ***Medicinal plants used for the treatment of Attention Deficit Hyperactivity Disorder (ADHD)***

S. No.	Name of the plant	Parts of the plant used	Forms and Preparation	Ref
1.	***Gingko biloba*** (Ginkgoaceae)	Leaves	120 -600 mg of leaf extract is taken orally two times daily.	[25]
2.	***Bacopamonniera*** (Scrophulariaceae)	Leaves and Stems	The extract is taken orally for upto 12 weeks.	[15], [16], [17]
3.	***Panaxgingseng***(Araliaceae)	Roots	0.5- 2g of the dried root per day on short term basis.	[45]
4.	***Pinusmaritima***(Pinaceae)	Extract	The extract from the bark called pycnogenol is given to children with ADHD in a dose of 1mg for four weeks. Also, in adults with ADHD, it decreases the dopamine by nearly 11%.	[51]
5.	***Centellaasiatica*** (Umbelliferae)	Extract	60-180 mg of golu kola extract daily to be used.	[21], [22], [23]

CATEGORY I: ***Medicinal plants used for the treatment of bacterial meningitis***

S. No.	Name of the plant	Parts of the plant used	Forms and Preparation	Ref
1.	***Allium sativum*** (Amaryllidaceae)	Bulb	Allicin , its active ingredient and alternative organic compounds in garlic area unit loaded with anti oxidant have antiviral capabilities that help in elimination and interference of infections.	[41], [42], [43], [44]
2.	***Ganoderma lucidum* (Curtis) P.Karst.** (polyporaceae)	Stem	6- 12g of ganodermalucidum extract daily for around 12 weeks is found to be beneficial	[47]
3.	***Olea europaea*L.** (Oleaceae)	Leaves	The leaves are dried or are prepared in capsule forms to be utilized for treatment.	[46]
4.	***Panax gingseng*** (Araliaceae)	Roots	It is consumed directly or stewed during a tea to get pleasure from the advantages of the ancient remedy.	[45]
5.	***Nepeta cataria*** (Laminaceae)	Leaves	The herb is stewed in water and also the liquor created is drunk like tea**.**	[28], [29]
6.	***Aloe barbadensis* Mill.** (Asphodelaceae)	Extract	The extract is consumed directly for betterment.	[27]

CATEGORY J: ***Medicinal plants used for the treatment of multiple sclerosis***

S. No.	Name of the plant	Parts of the plant used	Forms and Preparation	Ref
1.	***Zingiber officinale***(Zingiberaceae)	Ginger extract	200- 300 mg/kg ginger extract is taken on daily basis	[52]
2.	***Curcuma longa*** L. (Zingiberaceae)	Curcumin extract	50 -2000mg /day decreases CNS inflammation and demyelisation also, decreases the severity of EAE.	[13], [14]
3.	***Camellia sinensis*L.** (Theaceae)	Extract	Treatment with 600mg/day with epigallocatechin-3-gallate (EGCE) improves muscle metabolism during moderate exercise in MS patients.	[52]
4.	***Valeriana officinalis*L.** (Caprifoliaceae)	Extract	60-180 mg of golu kola extract daily to be used.	[52]
5.	***Nigella sativa*L.** (Ranunculaceae)	Seeds and oil	the extract from the plant part is used suppressed inflammation and demyelisation in the CNS	[52]
6.	***Panax ginseng* C.A.Mey.** (Araliaceae)	roots	Gingseng roots are used in powdered form the infiltration of inflammatory cells in the CNS. Also it has no adverse effect on MS patients as well as reduces fatigue and has a positive effect on quality of life.	[45]
7.	***Gingko biloba*** (Ginkgoaceae)	Leaves	240mg/day of the leaf extract relieves fatigue with no adverse effect on MS patients.	[25]

RESULT AND DISCUSSION

In the present scenario, many traditional species of plants from the North East region of India are reported to have been effective in the treatment of neurological disorders with most of them belonging to the families of Apiaceae, Ginkgoaceae, Theaceae, etc . These species are widely distributed among the seven states of north-east and over the years have been preserved by the locals folks of the region. Mental and neurological disorders has always been a major health issue among the individuals and the use of medicinal plants for its treatment marks as a milestone as it would be cost efficient and with least side effects. Also, these medicinal plants are found to have great antioxidant property mainly due to the presence of phytochemical constituents. So, the use of these plants can therefore provide enormous public health benefits, particularly in the third world country. However, after decades of research, documentation and examination of the medicinal properties of the plants, this sector still lacks behind. This is because most of the investigations are done at preliminary levels without proper scientific base and mankind do not have access to proper knowledge about the benefits these plants provide to us. Treatment with medicinal plants has a holistic approach. It has to be is integrated emotionally, physically, mentally and spiritually in our lives. Therefore, in the coming years, it will provide greater scope in health sector of living being.

CONCLUSION

It is now an accepted fact that many traditional plants found in Northeast India have better compatibility and acceptability within the human body. They have less side effects and better effectiveness. The engineered drugs are all the more expensive, having limited edge of wellbeing and more results when contrasted with natural CNS stimulants which are having wide edge of wellbeing, less expensive what's more, having mild side effects than synthetic medications, so more research is going on natural medications in CNS disorders. However, information regarding the herbal medication being classified in such a way might be helpful in drug formulations, drug substitution and also in systematizing our knowledge in this regard. This review can be helpful in creating mass awareness regarding the importance and need in conserving and preserving such plant species and also in the promotion of herbal medicinal knowledge within and outside the region and also enrichment of the gene bank for such economically important species before they are lost forever.

CONFLICTS OF INTEREST

The authors of the article have no conflicts of interest.

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