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Review Article

MEDICINAL PLANTS AS AGENT OFANTICONVULSANT ACTIVITY

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ABSTRACT

Epilepsy is one of the major neurological disorders where modern drug therapy is complicated by side-effects, teratogenic effects and long-term toxicity. Medicinal plants have been an important source for the discovery of novel bioactive compounds which served and continue to serve as lead molecules for the development of new drugs. Large body of evidence has accumulated to demonstrate promising potential of medicinal plants used in various traditional, complementary and alternative systems. Several Indian medicinal plants have been studied for pharmacological activity in recent years. To understand the mechanism of action, the researchers have worked at molecular levels and several significant phytochemicals have been isolated. The present review is aimed at compiling data on promising Indian medicinal plants, which are being used as anticonvulsant agents, are discussed.

Keywords: Anticonvulsant, Epilepsy, Phytochemical, Medicinal Plants.

INTRODUCTION

The term epilepsy is collectively designated for a group of chronic central nervous system disorders characterized by spontaneous occurrence of seizures generally associated with the loss of consciousness and body movements (convulsions) and up to 5% of the world population develops epilepsy in their lifetime.[1] The current therapy of epilepsy with modern antiepileptic drugs (AEDs) is associated with side effects, dose-related and chronic toxicity, as well as teratogenic effects, and approximately 30% of the patients continue to have seizures with current antiepileptic drugs therapy.[2-4] The discovery of novel antiepileptic drugs relies upon the preclinical employment of animal models to establish efficacy and safety prior to the introduction of the AEDs in human volunteers.[5] Clearly, the more predictive the animal model for any given seizure type or syndrome, the greater the likelihood that an investigational AED will demonstrate efficacy in human clinical trials.[6]

Traditional systems of medicine are popular in developing countries and up to 80% of the population relies on traditional medicines or folk remedies for their primary health care need.[7] Medicinal plants are believed to be an important source of new chemical substances with potential therapeutic effects.[8] The unique and complex structures of natural productscannot be obtained easily by chemical synthesis. A number of plants in the world have been used in traditional medicine remedies.[7-11] Several plants used for the treatment of epilepsy in different systems of traditional medicine have shown activity when tested in modern bioassays for the detection of anticonvulsant activity[6] and many such plants are yet to be scientifically investigated. Anticonvulsant drugs are used to control the convulsions by inhibiting the discharge and then producing hypnosis. Varioussynthetic drugs, *viz*. sodium diphenylhydantoin (Dialtin), barbiturates, pyrimidon, succinamides, diazepines*etc*. are used for the treatment. About 40% patients are refractory totherapeutic intervention and thus its effective and safe therapy remains a challenge[2-4]This review summarizes the literature on anticonvulsant activities of 80 medicinal plants used for the treatment of epilepsy and convulsive disorders in the indigenous system of medicine. The details are presented in a tabular form. The data includes the plant part involved, the nature of the extract or fraction used and model used for the activity wherever available. All the currently available antiepileptic drugs are synthetic molecules. Medicinal plants used for the therapy of epilepsy in traditional medicine have been shown to possess promising anticonvulsant activities in animal models of anticonvulsant screening can be an invaluable source for search of new antiepileptic compounds. The present report is an investigation of anticonvulsant activities of some indigenous medicinal plants used for the treatment of epilepsy by traditional healers.

MATERIALS AND METHODS

The keywords used for this review were epilepsy, medicinal plants, animal models, anticonvulsant, natural product and antiepileptic. The search profound using Chemical Abstracts, Biological Abstracts, Web of Science and Science Direct. From the literature search, all plants that are used

TABLE 1: LIST OF MEDICINAL PLANTS USED AS ANTICONVULSANT AGENT IN INDIAN MEDICINE

S. No.	Plant Name	Part Used	Family	Extract Used	Model Used	Reference
1.	*Abrusprecatorious*	Root	Fabaceae	Ethanol	LIS, SIS	17
2.	*Aeglemarmelos*	Fruit	Rutaceae	Aqueous	PTZ, MES	20
3.	*Albizzialebbeck*	Leaf, Root	Fabaceae	Methanol	PIC,PTZ, MES	21
4.	*Allium ascalonicum*	Shallot	Liliaceae	Alcohol	LIS	17
5.	*Allium cepa*	Bulb	Liliaceae	Alcohol	LIS, SIS	17
6.	*Allium sativum*	Bulb	Liliaceae	Alcohol	LIS	17
7.	*Alstoniaboonei*	Stem bark	Apocynaceae	Alcohol	LIS	17
8.	*Alstonia scholaris*	Flower	Apocynaceae	Alcohol	MIS	22

9.	*Altingiaexcelsa*	Entire plant	Hamamelidaceae	-	ACV	23
10.	*Apiumgraveolans*	Seed	Apiaceae	Alkaloidal fraction, essential oil	MES, MIS	24
11.	*Basella alba*	Leaf, Stem	Basellaceae	Alcohol	LIS, SIS	17
12.	*Basellarubra*	Leaf, Stem	Basellaceae	Alcohol	LIS, SIS	17
13.	*Benincasahispida*	Fruit	Cucurbitaceae	Methanol	PTZ, MES, PIC	25
14.	*Berberislycium*	Root	Berberidaceae	Ethanol	MES	15
15.	*Boerhaaviadiffusa*	Root	Nyctaginaceae	Methanol	PTZ	26
16.	*Borassusflabellifer*	Root	Arecaceae	Ethanol	PTZ	27
17.	*Buteamonosperma*	Flower	Fabaceae	Petroleum ether	MES, PTZ, SIS	28
18.	*Calophyllumapetalum*	Nuts	Clusiaceae	-	PTZ	29,30, 31,32
19.	*Calophyllumtomentosum*	Nuts	Clusiaceae	-	PTZ	29,30, 31,32
20.	*Cannabis indica*	Flowering tops	Cannabaceae	Resin	MES	33,34, 35
21.	*Canscora decussate*	Entire plant	Gentianaceae	Alcohol	MES	36
22.	*Carica papaya*	Leaf	Caricaceae	Alcohol	MES, PTZ	37
23.	*Celastruspaniculatus*	Seed oil	Calastraceae	Oil	PIC, SIS, LIS	38
24.	*Centellaasiatica*	Entire plant, Leaf	Apiaceae	Aqueous	LIS, PTZ, SIS, MES	39.40. 41
25.	*Chenopodiumblitum*	Aerial part	Chenopodiaceae	Ethanol	MES	42
26.	*Clerodendrumcolebrookianum*	Leaf	Verbanaceae	Methanol	SIS	43

27.	*Cocculushirsutus*	Root, Stem	Menispermaceae	Ethanol	MES, MIS	44
28.	*Connaruswightii*	Aerial part	Connaraceae	Ethanol	SIS	16
29.	*Convolvulus pluricaulis*	Entire plant	Convolvulaceae	Ethanol	MES	45
30.	*Crocus sativus*	Stigma and style	Iridaceae	-	PTZ	46
31.	*Curcuma amada*	Rhizome	Zingiberaceae	Ethanol	MES	47
32.	*Cyathea nilgirensis*	Aerial part	Cyathiaceae	Ethanol	MES	48
33.	*Cylistascariosa*	Root	Fabaceae	Ethanol	SIS	15
34.	*Delphinium denudatum*	Entire plant	Ranunculaceae	Ethanol	MES	49
35.	*Dilleniaindica*	Leaf	Dilleniaceae	Ethanol	MES	47
36.	*Diospyros peregrine*	Entire plant	Ebenacaea	-	ACV	23
37.	*Elaeocarpusganitrus*	Fruit	Elaeocarpaceae	Ethanol	MES, MIS	50
38.	*Elleteriacardamomum*	Seed	Zingiberaceae	-	ACV	51
39.	*Eryngiumfoetidum*	Entire plant	Apiaceae	Ethanol	SIS	52
40.	*Euphorbia antiquorum*	Entire plant	Euphorbiaceae	-	MIS	53
41.	*Euphorbia dracunculoides*	Entire plant	Euphorbiaceae	Ethanol	ACV, MES	47
42.	*Euphorbia tirucalli*	Aerial part	Euphorbiaceae	Ethanol	ACV, MIS	15
43.	*Evolovulusnummularius*	Entire plant	Convolvulaceae	Defatted alcoholic extract	MIS	53,54
44.	*Grewiahirsuta*	Entire plant	Tiliaceae	Ethanol	SIS	55
45.	*Gymnosporiafalconeri*	Aerial part	Celastraceae	Ethanol	MIS	55
46.	*Hidiscusrosasinensis*	Flower	Malvaceae	Ethanol	MES, PTZ	56

47.	*Iris kumaonensis*	Entire plant	Iridaceae	Ethanol	MES	48
48.	*Juniperusmarcopoda*	Fruit	Cupressaceae	Essential oil	ACV	57
49.	*Leeaindica*	Leaf	Vitaceae	Ethanol	SIS	15
50.	*Leonotisleonurus*	Leaf	Lamiaceae	Aqueous	PTZ, PIC	58
51.	*Lettsomiasetosa*	Aerial part	Convolvulaceae	Ethanol	MES	55
52.	*Luvangascandens*	Fruit	Rutaceae	Essential oil	MES	59
53.	*Matricariachamomilla*	Flower	Asteraceae	Ethanol	PTZ	60
54.	*Mikaniacordata*	Aerial part	Asteraceae	Ethanol	MES	47
55.	*Mimosa pudica*	Leaf		Decoction	PTZ, SIS	61
56.	*Nardostachysjatamansi*	Rhizome	Valerianaceae	Ethanol	ACV, MES, PTZ	62,63
57.	*Ocimum sanctum*	Entire plant	Lamiaceae	-	ACV	64
58.	*Paeoniaemodi*	Root	Paconiaceae	-	MIS, MES	65
59.	*Picrorhizakurrooa*	Entire plant	Scrophulariacea e	Ethanol	MIS	62
60.	*Pistaciaintegerrima*	Galls	Anacardiaceae	Essential oil	PTZ	66
61.	*Polypodiumvulgare*	Root	Polypodiaceae	Aqueous	MES, PTZ	67
62.	*Pongamiapinnata*	Seed	Fabaceae	Seed oil	MES	68
63.	*Prunusspinosa*	Fruit	Rosaceae	-	PTZ	67
64.	*Pterocarpussantalinus*	Heartwood, bark	Fabaceae	Ethanol	MES	69,70
65.	*Rauvolfiaserpentina*	Root, Stembark	Apocynaceae	Alkaloidal fraction	LIS	17
66.	*Rauvolfiatetraphylla*	Entire plant	Apocynaceae	Ethanol	MES	47
67.	*Rhododendron niveum*	Aerial part	Eriacaceae	Ethanol	SIS	55

68.	*Riveahypocrateriformis*	Fruit	Convolvulaceae	Ethanol	MES	52
69.	*Rubusellipticus*	Leaf	Rosaceae	Ethanol	MES	71
70.	*Salvia haematodes*	Root	Lamiaceae	Ethanol	MES	72
71.	*Sapindustrifoliatus*	Seed	Sapindaceae	Unsaponifiable matter	MES	73
72.	*Sepia officinalis*	Shell	Sepiadeae	Alkali fraction	ACV	74
73.	*Sesbaniagrandiflora*	Leaf	Fabaceae	Petroleum ether, Acetone	MES	75
74.	*Solanumkhasianum*	Entire plant	Solanaceae	Ethanol	MES	15
75.	*Stenochlaenapalustris*	Entire plant	Polypodiaceae	Ethanol	MES	16
76.	*Swertiapurpurascens*	Entire plant	Gentianaceae	Ethanol	MES, SIS	16
77.	*Vanda roxburghii*	Entire plant	Orchidaceae	Ethanol	MES	47
78.	*Vitexnegundo*	Leaf	Verbenaceae	Petroleum ether	LIS, SIS	76
79.	*Withaniaashvagandha*	Root	Solanaceae	Alkaloidal fraction	ACV	77
80.	*Withaniasomnifera*	Entire plant	Solanaceae	-	ACV	23

leptazole-induced seizure (LIS), maximal electroshock seizure (MIS), picrotoxin-induced convulsions (PIC), pentylenetetrazole-induced seizure (PTZ), strychnine-induced seizure (SIS), Bicuculline (BI), N-methyl-dl aspartic acid

ethnomedically to treat epilepsy or those which have been tested for anticonvulsant activity are included in this review. The references obtained were later consulted.

RESULTS AND DISCUSSION

The 20th century has witnessed considerable progress in anticonvulsant drug development.[13] The major drugs in clinical use, *i.e.* phenytoin, carbamazepine, valproate, benzodiazepines, ethosuximide, phenobarbital and primidone were developed and introduced between 1910 and 1970 and will be referred to as 'old drugs' or 'first generation' drugs in the following. After a hiatus of over 20 years, several new anticonvulsant drugs, *i.e.*vigabatrin, gabapentin, felbamate, lamotrigine, oxcarbazepine, tiagabine and topiramate have been introduced into clinical practice, referred to as 'new drugs' or 'second generation'

drugs in the following. More recent anticonvulsants which are in preclinical or clinical development will be referred to as 'third generation' drugs.[14]

Many plants were known for their anticonvulsant activity. Reviews articles[15-19] were previously published with regards to plants with anticonvulsant properties.

CONCLUSION

It can be concluded that studies with species from a range of families have been shown anticonvulsant properties and understanding of the complex mechanism of epilepsy. Academic institutions should invest in this type of study with medicinal plants and contribute to the benefit of the populations needing this type of health care. Thus, it is the wish of the authors that this review article will stimulate the interests in further investigations into natural products for new antiepileptic agents.

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