

ANTICONVULSANT PROPERTIES OF SOME MEDICINAL PLANTS: A REVIEWNIVEDHA SRINIVASAN¹, ANITHA ROY^{2*}¹Department of Dental Surgery, Saveetha Dental College and Hospitals, Chennai, Tamil Nadu, India. ²Department of ???, Faculty of Pharmacology, Saveetha Dental College and Hospitals, Chennai, Tamil Nadu, India. Email: anitharoy2015@gmail.com

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ABSTRACT

Introduction: Epilepsy is the tendency to have seizures that start in the brain. The brain uses electrical signals to pass messages between brain cells and when these signals are disrupted, it leads to a seizure. A number of synthetic antiepileptic drugs are available in practice, but various medicinal plants act as an important source of treatment for epilepsy; plants such as *Aeollanthus suaveolens*, *Passiflora caerulea*, *Persea americana*, *Annona diversifolia*, and *Boerhavia diffusa* have good anticonvulsant activity.

Objective: Anticonvulsant drugs are used to control the convulsions by inhibiting the discharge and then producing hypnosis. The objective is to understand various medicinal plants and plant components, which are being used as an anticonvulsant.

Results: *A. suaveolens* essential oils are the main constituents were deemed to display anticonvulsant activity. *P. caerulea* is reputed to have herbal activity as a sedative and anticonvulsant and it is often used as a relatively disease resistant root stock. Whereas *P. americana*, extract produces its anticonvulsant effect by enhancing gamma-aminobutyric acid ergic neurotransmission and or action in the brain. *B. diffusa* consists of a calcium channel antagonist compound, lirioidendrin that is responsible for its anticonvulsant activity.

Conclusion: Since epilepsy has become a common brain disorder, having knowledge of the medicinal plants with an anticonvulsant activity will be beneficial to the society.

Keywords: Antiepileptic, *Aeollanthus suaveolens*, *Passiflora caerulea*, *Persea americana*, *Annona diversifolia*, *Boerhavia diffusa*.

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INTRODUCTION

Epilepsy is the tendency to have seizures that start in the brain. The brain uses electrical signals to pass messages between brain cells and when these signals are disrupted and it leads to a seizure [1]. According to the WHO, about 450 million people in the entire world have suffered mental, neurological, or behavioral problems out of which 1-2% has had epileptic seizures [2]. Seizures are divided into two main types; generalized and focal. Generalized seizures occur if the abnormal electrical activity affects all or most of the brain cells, whereas focal seizure is the burst of electrical activity which starts and stays in one part of the brain, thus leading to localized symptoms [3].

The most common treatment for epilepsy is antiepileptic drugs (AEDs). They are used to control the convulsions by inhibiting the discharge and then producing hypnosis. Various synthetic AEDs are available in practice such as phenytoin, phenobarbital, carbamazepine, primidone, and valproate.

Certain drugs consist of various side effects which affect the central nervous system. They might also lead to idiosyncratic side effects which are usually rare and unpredictable which are not dose related. For example, phenytoin can cause the gums to swell and valproate can cause hair loss and weight gain. Thus, the current therapeutic treatment of epilepsy with modern AEDs is associated with side effects, dose-related and chronic toxicity, and teratogenic effects, with approximately 30% of the patients continue to have seizures with current AEDs therapy [4].

Plants have many medicinal properties due to the presence of various phytochemicals. In folk, medicine plants are used for the treatment of many disease conditions including epilepsy. The active constituents

in plants show a direct pharmacological action on our body including various organs, having same mechanism of action as that of synthetic drugs [5]. Many essential oils extracted from plants have a significant effect on seizures by having a calm and relaxing effect [6].

There are a number of medicinal plants being used for the treatment of epilepsy such as *Abelmoschus angulosus*, *Allium sativum*, *Artemisia* spp., *Cannabis sativa*, *Egletes viscosa*, *Magnolia grandiflora*, and *Xylopi* spp. [7]. In this article, plants such as *Aeollanthus suaveolens*, *Passiflora caerulea*, *Persea americana*, *Annona diversifolia*, and *Boerhavia diffusa* are reviewed.

DISCUSSION***A. suaveolens***

Aeollanthus is a genus in the mint family, Lamiaceae [8]. They are commonly found in Northern Nigeria, Sudan, East Africa, and Brazil. *A. suaveolens* is a succulent, annual herb growing 20-50 cm tall. It is a short-lived perennial herb that stays erect, bushy and can grow till 80 cm [6]. The major components are linalool, 2-decan-5-olide, and linalyl acetate [9] (Fig. 1).

In Africa, the leaves are stuffed into the ear like an earplug for relief from earaches. As a soothing tea, it can be used for menstrual cramps. In Northern Nigeria, for its aromatic foliage, it is used to flavor soup. In North-Eastern Brazil, it is used as a medicinal plant for the treatment of eye, ear, and skin infections. This herb has antimicrobial and anti-inflammatory properties too [10].

A study conducted on mice with the essential oil of *A. suaveolens* has reported dose-dependent marked effects on the central nervous system and anticonvulsant effect [11]. Another study with the flowers and leaves of the plant have showed a significant content of monoterpenes,

which was then concluded to be reason for anticonvulsant and sedative properties.

P. caerulea

Passiflora belongs to the *Passifloraceae* family [12]. These plants are found mostly in South America, Australia, and Argentina. *P. caerulea* is a woody vine capable of growing to 15-20 m high where supporting trees are available. The leaves are alternate, palmate five-lobed like a spread hand, 10-18 cm long and wide (Fig. 2).

It contains flavonoids, alkaloids armalinici, and chrysin. Tetracycline B and epitetracycline B, and cyanogenic glycosides have been found in the leaves. It is eaten raw and can be used as a substitute for blackberries. They are also used in scent making. In South America, *P. caerulea* is mostly used to alleviate stress and anxiety [13].

In a study conducted recently prove that the anticonvulsant property of *P. caerulea* in the clonic seizure-pentylenetetrazole (PTZ) model. As the effect of this in clonic seizure, it is suggested to be a useful treatment of absent seizure. The mechanism of benzodiazepine receptor in *P. caerulea* is also known to be vital [14]. Similarly, a study conducted on chrysin was also found to be a ligand for the benzodiazepine receptors, when administered to mice by the intracerebroventricular route [15].

P. americana

P. americana, commonly known as avocado, belongs to the family Laureacea, is native to Central and S. America [16]. It is distributed in tropical and subtropical countries worldwide. It grows to a height of 20 m. The single-seeded fruit which is 7-20 cm long has a leathery skin that ranges from yellow-green to purple. The mesocarp or pulp is edible and is yellow to yellow-green and has a buttery consistency (Fig. 3).



Fig. 1: *Aegle marmelos suaveolens*

Avocados contain a number of bioactive phytochemicals including carotenoids, terpenoids, D-mannoheptulose, persenone A and B, phenols, and glutathione. The pulp contains 65-80% moisture, 1-4% protein, and 3-30% oil. The fruit contains many vitamins, minerals, stigmasterol, campesterol, and beta-sitosterol [17]. Avocado is useful for weight management, DNA damage protection, osteoarthritis, and cancer [16]. The plant is used in traditional medicine for the treatment of various ailments such as menorrhagia, hypertension, stomach ache, bronchitis, diarrhea, and diabetes [18].

Various morphological parts of *P. americana* are widely used in African traditional medicines for the treatment, management and/or control of a variety of human ailments, including childhood convulsions and epilepsy. A study indicated that the *P. americana* leaf aqueous extract possess an anticonvulsant property, which was conducted on mice against PTZ, picrotoxin (PCT), and bicuculline (BCL). It appeared that

“avocado” leaf aqueous extract produces its anticonvulsant effect by enhancing gamma-aminobutyric acid ergic (GABAergic) neurotransmission in the brain. The extract significantly delayed the onset of PTZ, and also profoundly antagonized PCT induced seizures but only weakly antagonized BCL induced seizures [19].

Annona diversifolia

Annona diversifolia belongs to the *Annonaceae* family [20]. It is basically originated indigenously in the mountains and foothills of South-Western Mexico, Guatemala, and Salvador. *A. diversifolia* are evergreen or semi-deciduous, tropical trees or shrubs (Fig. 4).

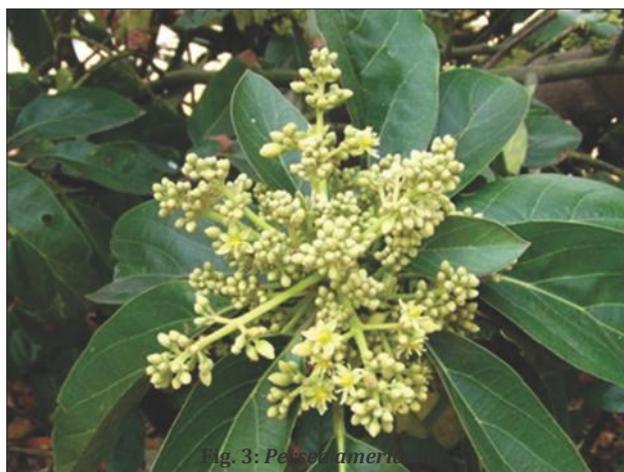


Fig. 3: *Persea americana*



Fig. 2: *Passiflora caerulea*

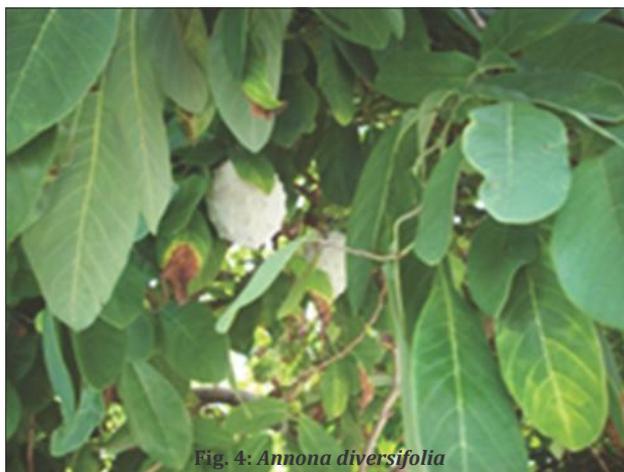


Fig. 4: *Annona diversifolia*



Fig. 5: *Boerhavia diffusa*

Annonas are consumed as fresh fruits but are widely used in folk medicine for treating pain and other ailments. It is composed of phenols and flavonoids [21]. The fruit has a sweet, aromatic, pleasant flavor and is eaten raw. The fruit is used also in jams, jellies, and preservatives.

In a study conducted by extracting the powder of *Annona*, led to the isolation of palmitone, which was found to be the anticonvulsant active compound it [22]. *A. diversifolia's* root bark aqueous extract significantly delayed the onset of seizures induced by pilocarpine as it had reportedly produced GABA neurotransmission by blocking the chloride linked channels linked to GABAA-receptors [23]. It was observed that it may also be due to one or more of the known mechanisms of anticonvulsant action, such as alteration of Na⁺/K⁺ATPase expression and inhibition of expression of inducible nitric oxide.

B. diffusa

B. diffusa belongs to the family of *Nyctaginace* [24]. It is widely dispersed, throughout India, The pacific and southern United States. *Diffusa* is used as a green leafy vegetable in many Asian and African countries [24].

The plant is rich in lignans, xanthenes, punarnavine, ursolic acid, and lirioidendrin as well as retinoid [24]. *B. diffusa* has shown some *in vitro* anticancer, antiestrogenic, immunomodulatory, and antiameobic activity. It has the ability to improve eyesight and has diuretic properties and is also known for controlling blood sugar levels in diabetic patients [24] (Fig. 5).

A study conducted on lirioidendrin, which was isolated from the methanolic extract of roots of *B. diffusa*, have an anticonvulsant activity against the PTZ induced convulsions. It showed calcium channel antagonist activity, which may be the reason to the anticonvulsant property of *B. diffusa*. As this activity is retained only in the lirioidendrin rich fraction, it proves its anticonvulsant property [25].

CONCLUSION

The majority of epileptic seizures are controlled by medication, particularly anticonvulsant drugs. The type of treatment will depend on several factors including severity, overall health conditions, and medical history. Plants are with different phytochemicals and some of it is with potent anticonvulsant effect. *A. suaveolens* (essential oil), *P. caerulea*, (chrysin) *P. americana* (leaf aqueous extract), *Annona diversifolia* (Plamitone), and *B. diffusa* (Lirioidendrin) have proven anticonvulsant activity. Hence, these plants may be used as an alternative source to AEDs.

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