

HERBAL MEDICINES AS POTENTIAL ANTICONVULSANT AGENTS: A REVIEW OF MEDICINAL PLANTS FOR EPILEPSY MANAGEMENT

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ABSTRACT

Epilepsy is a chronic neurological disorder characterized by recurrent and unpredictable seizures caused by abnormal electrical activity in the brain. It affects nearly 1% of the global population and represents a significant public health concern due to its impact on physical health, cognitive function, and overall quality of life. Although several conventional antiepileptic drugs are available for the management of epilepsy, many patients experience inadequate seizure control or suffer from undesirable adverse effects associated with long-term pharmacotherapy. Consequently, there is increasing interest in alternative therapeutic approaches, particularly those derived from medicinal plants.

In many developing countries, traditional systems of medicine continue to play an important role in primary healthcare, with a large proportion of the population relying on herbal remedies for the treatment of various ailments. Medicinal plants contain a wide variety of bioactive phytoconstituents such as flavonoids, alkaloids, terpenoids, and phenolic compounds that may contribute to anticonvulsant activity through diverse pharmacological mechanisms. Historically, numerous herbs have been used in traditional medical practices for the management of epilepsy and related neurological disorders.

Despite their long-standing traditional use, the scientific validation of many plant-based anticonvulsant therapies remains incomplete. Therefore, systematic evaluation and pharmacological investigation of these medicinal plants are essential to identify their active components and therapeutic potential. This review provides an overview of selected medicinal plants reported to possess anticonvulsant properties and discusses their possible mechanisms of action, highlighting their potential as safer and more effective alternatives or complementary therapies for epilepsy management.

Keywords: Epilepsy, Anticonvulsant activity, Medicinal plants, Phytoconstituents, Herbal medicine, Traditional therapy

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INTRODUCTION

Convulsion is a neurological condition characterized by sudden, rapid, and involuntary contractions of muscles, resulting in uncontrolled shaking or jerking movements of the body. These episodes occur due to abnormal electrical activity in the brain that temporarily disrupts normal neurological function. Convulsions are

commonly associated with epilepsy, a chronic neurological disorder marked by recurrent and unprovoked seizures.

Epilepsy affects nearly 1% of the global population and is considered one of the most common neurological disorders worldwide, second only to stroke. It is characterized by repeated seizure episodes caused by

abnormal, excessive, and synchronized neuronal discharges in the brain. These abnormal discharges may briefly interfere with mental, motor, sensory, or autonomic functions. Globally, epilepsy affects approximately 50 million people, with nearly 7 million individuals living with the condition in India alone.[1]

Epilepsy is generally defined as a disorder in which a person experiences recurrent seizures resulting from an enduring predisposition of the brain to generate epileptic activity. Individuals who experience isolated seizures due to temporary or correctable causes are not necessarily considered epileptic.[2] The etiology of epilepsy is complex and multifactorial, including metabolic disturbances, infections, traumatic brain injuries, structural abnormalities of the brain, and genetic factors.[3] Despite the availability of numerous antiepileptic drugs (AEDs), nearly one-third of patients continue to experience drug-resistant seizures, highlighting the limitations of existing therapeutic options.[4]

Beyond its clinical consequences, epilepsy imposes a substantial social and economic burden on affected individuals, families, and healthcare systems worldwide.[5] Therefore, the development of new antiepileptic drugs with improved efficacy and fewer adverse effects remains an important research priority.[6]

A seizure itself does not necessarily indicate epilepsy. The disorder is typically diagnosed when a person experiences two or more unprovoked seizures. These seizures may involve brief involuntary movements affecting either the entire body or specific body parts and may also be accompanied by changes in consciousness or behavior.[7] Apart from febrile seizures, approximately 5% of the general population may experience at least one seizure during their lifetime.[8]

Historically, several medicinal plants have been used in traditional systems of medicine for the treatment of epilepsy and seizure-related disorders. The first chemical substance used for epilepsy treatment was potassium bromide (KBr), introduced in 1850. Later, phenobarbital became the first widely used clinical antiepileptic drug. Phenytoin was subsequently identified as the first antiepileptic drug discovered through an animal seizure model. In the 1940s, trimethadione was developed for the treatment of absence seizures following experimental studies using the pentylenetetrazol-induced seizure model.[9]

Although many new antiepileptic drugs have been introduced since the 1990s, a significant proportion of patients still experience uncontrolled seizures. Therefore, there is a continuing need to develop ideal

antiepileptic drugs with characteristics such as broad-spectrum activity, rapid onset of action, minimal adverse effects, good oral bioavailability, and cost-effectiveness.[10]

According to the World Health Organization (WHO), nearly 80% of people with epilepsy live in low- and middle-income countries, where access to proper medical care remains limited. Furthermore, about one-third of patients continue to suffer from seizures despite receiving appropriate pharmacological therapy. In addition, currently available antiepileptic drugs may cause various side effects, cumulative toxicity during long-term use, and potential risks to fetal development during pregnancy. These limitations have encouraged researchers to explore alternative therapeutic strategies, including the use of medicinal plants and herbal compounds with potential anticonvulsant properties.

OBJECTIVES OF THE REVIEW

The primary objective of this review is to provide a comprehensive overview of medicinal plants with reported anticonvulsant activity and to evaluate their potential role in the management of epilepsy. The review aims to highlight the therapeutic significance of plant-derived compounds that have been traditionally used in various systems of medicine for the treatment of seizure disorders.

Specifically, the objectives of this review are:

1. **To summarize the current knowledge of epilepsy and seizure disorders**, including their prevalence, causes, and limitations of existing antiepileptic drug therapies.
2. **To identify and discuss medicinal plants traditionally used for the treatment of epilepsy**, with emphasis on their ethnomedicinal importance.
3. **To review the pharmacological studies evaluating anticonvulsant activity of herbal drugs**, particularly those tested in experimental animal models.
4. **To analyze the bioactive phytoconstituents responsible for anticonvulsant effects**, such as alkaloids, flavonoids, terpenoids, and phenolic compounds.
5. **To explore the possible mechanisms of action of plant-derived compounds** involved in seizure control.
6. **To highlight the potential of herbal medicines as safer and more effective alternatives or complementary therapies** for epilepsy management.

7. **To identify research gaps and encourage further scientific investigations** for the development of novel plant-based antiepileptic drugs.

METHODOLOGY / LITERATURE SEARCH STRATEGY

A comprehensive literature review was conducted to collect relevant information on medicinal plants with reported anticonvulsant activity and their potential role in the management of epilepsy. Scientific articles, review papers, and experimental studies were systematically searched using major electronic databases including **PubMed, Google Scholar, ScienceDirect, Scopus, and Web of Science**. Additional information was obtained from books, theses, and authoritative reports related to medicinal plants and neurological disorders.

The literature search was performed using combinations of keywords such as “**epilepsy,**” “**convulsion,**” “**seizure disorders,**” “**anticonvulsant activity,**” “**medicinal plants,**” “**herbal drugs,**” “**phytoconstituents,**” and “**traditional medicine.**” Boolean operators such as AND and OR were applied to refine the search and retrieve relevant publications.

Articles published in **English language journals** that reported the anticonvulsant activity of medicinal plants, their phytochemical constituents, pharmacological mechanisms, and experimental evaluations were included in this review. Studies describing **in vitro investigations, in vivo animal models (such as maximal electroshock seizure and pentylenetetrazol-induced seizure models), and ethnomedicinal uses of plants for epilepsy treatment** were considered for analysis.

Duplicate studies, non-scientific reports, and articles lacking sufficient experimental evidence were excluded from the review. The selected literature was carefully evaluated to extract information regarding plant species, plant parts used, active phytochemicals, experimental models employed, and observed anticonvulsant effects.

The collected data were then systematically compiled and analyzed to provide an overview of medicinal plants with anticonvulsant potential and their possible therapeutic applications in epilepsy management.

Types of Epileptic Seizures

1. Partial (Focal) Seizures

Partial or focal seizures originate in a specific region of the brain. These seizures may produce motor, sensory, autonomic, or psychological symptoms depending on the brain area involved. **Simple partial seizures** occur without a noticeable loss of consciousness. Patients may experience abnormal sensations such as tingling, visual disturbances, dizziness, alterations in smell or hearing, or changes in autonomic functions.

Complex partial seizures, in contrast, are associated with impaired awareness or reduced responsiveness to the surrounding environment. During such episodes, individuals may appear confused, unresponsive, or unable to interact normally. In some cases, focal seizures may spread to involve both hemispheres of the brain, resulting in **secondary generalized seizures**, typically presenting as tonic-clonic convulsions. Secondary generalization frequently occurs when the seizure focus is located in the frontal lobe of the brain.[11]

2. Generalized Seizures

Generalized seizures involve both hemispheres of the brain simultaneously. **Absence seizures**, also known as petit mal seizures, are characterized by a brief and sudden loss of awareness while body posture is usually maintained. These episodes generally last only a few seconds and are not followed by confusion. Awareness typically returns immediately after the seizure.

Atypical absence seizures differ from typical absence seizures in both clinical presentation and electrophysiological features. A **simple absence seizure** involves a brief interruption of consciousness accompanied by generalized epileptic discharges, whereas **complex absence seizures** may present with additional symptoms such as subtle motor movements.

Approximately one-fifth of individuals with epilepsy experience **generalized tonic-clonic seizures**, previously known as grand mal seizures. **Atonic seizures** involve a sudden loss of muscle tone that usually lasts for one to two seconds and may lead to falls. Although consciousness may be briefly impaired, post-seizure confusion is usually absent. **Myoclonic seizures** are characterized by sudden, short muscle jerks that may affect either a localized region or the entire body.[11]

Historical Background of Epilepsy

The term **epilepsy** is derived from the Greek words *epilepsia* (meaning “to seize”) and *epilambanein* (meaning “to take hold of”). Historically, epilepsy was frequently associated with supernatural beliefs, including demonic possession or spiritual influence. In certain traditional societies, epilepsy was thought to result from the presence of evil spirits. For example, in some Hmong communities, seizures were interpreted as spiritual events, and individuals experiencing them were sometimes believed to possess shamanic abilities.

During the nineteenth century, neurologist **Jean-Martin Charcot** studied epilepsy at the Salpêtrière Hospital in Paris, which later became a major center for neurological research. At that time, many individuals with epilepsy were mistakenly believed to be mentally

unstable or affected by other chronic illnesses such as syphilis.

Across different cultures, epilepsy has long been surrounded by myths and social stigma. In some African societies, the disorder was attributed to witchcraft, poisoning, or supernatural forces. Ancient Romans referred to epilepsy as **Morbus comitialis**, meaning “disease of the assembly,” because seizures occurring during public gatherings were believed to be ominous signs.

Although significant scientific progress has been made in understanding epilepsy, social stigma still persists in some regions. However, awareness is gradually increasing, especially in developed countries. Historically, the Greek physician **Hippocrates** was among the first to challenge supernatural explanations of epilepsy, proposing that it was a disease originating in the brain rather than a divine punishment.[12,13]

Causes of Epilepsy

In many cases, the precise cause of epilepsy cannot be identified. However, several factors are known to contribute to the development of seizures, most of which involve damage or dysfunction within the brain. Common causes of epilepsy include:

1. Reduced oxygen supply to the brain during birth
2. Head injuries resulting from accidents or trauma during childhood or adulthood
3. Brain tumors or structural abnormalities
4. Genetic disorders such as tuberous sclerosis that affect brain development
5. Central nervous system infections including encephalitis and meningitis
6. Stroke or other forms of brain injury

Although genetic predisposition may contribute to epilepsy, the condition may also arise due to traumatic brain injury, infections, high fever, or intracranial tumors. The term **epilepsy** itself does not specify the exact cause or severity of the condition.

Genetic factors play a significant role in many epilepsy cases, particularly in infants and young children, although seizures may develop at any age. However, not all individuals who experience severe head trauma subsequently develop epilepsy. Certain environmental or physiological triggers may also provoke seizures in susceptible individuals. These triggers may include flashing lights, reading, emotional stress, sleep deprivation, alcohol consumption, fever, or extreme temperature changes.

In some women, seizure frequency may fluctuate with hormonal changes associated with the menstrual cycle, a condition referred to as **catamenial epilepsy**. [14,15]

The causes of epilepsy may also vary depending on age. In neonates and infants, common causes include **hypoxic-ischemic encephalopathy, congenital brain abnormalities, metabolic disorders, and infections of the central nervous system**. In childhood, febrile seizures and head injuries are frequently associated with seizure episodes. During adolescence and adulthood, epilepsy often results from previous brain injuries, infections, or structural abnormalities of the central nervous system. In older adults, **cerebrovascular diseases, brain tumors, degenerative disorders, and head trauma** are among the most common causes of seizures.[16]

Symptoms and Signs

Epilepsy is a neurological disorder characterized by abnormal electrical activity in the brain that leads to recurrent seizures. These seizures may result in temporary disturbances in consciousness, movement, sensation, or behavior. A diagnosis of epilepsy is usually made when an individual experiences **two or more unprovoked seizures** that cannot be explained by identifiable medical conditions such as drug withdrawal or severe hypoglycemia.

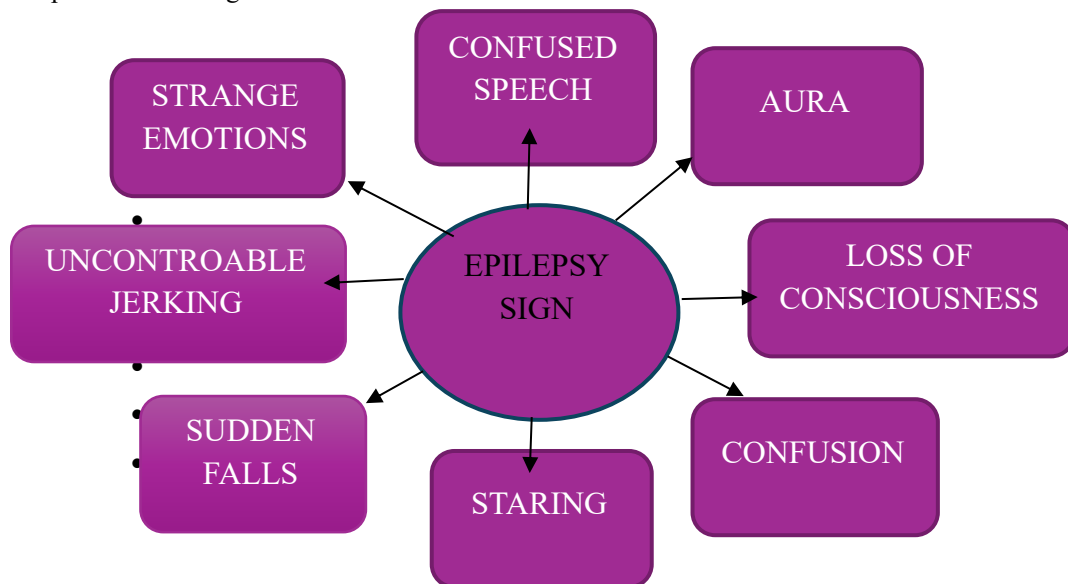
The symptoms experienced during a seizure depend on the specific region of the brain where abnormal electrical activity begins. In general, the left hemisphere of the brain controls the right side of the body, while the right hemisphere controls the left side. Based on the pattern of abnormal brain activity, seizures are commonly classified as **focal (partial)** or **generalized**. [17,18]

Focal seizures originate in a localized area of the brain and may produce symptoms related to the affected cerebral hemisphere. These seizures can be further categorized as **simple focal seizures**, in which awareness remains intact, and **complex focal seizures**, which involve impaired consciousness. During complex seizures, patients may display behaviors such as mumbling, chewing motions, confusion, or inappropriate actions.

Generalized seizures, on the other hand, involve widespread electrical activity affecting both hemispheres of the brain. These seizures may be **convulsive**, characterized by noticeable muscle contractions and jerking movements, or **non-convulsive**, which may involve brief lapses of awareness without obvious motor symptoms. In some cases, individuals may experience episodes of staring or sudden unresponsiveness, while others may exhibit repetitive jerking movements of the limbs.[19]

The clinical manifestations of seizures may vary among individuals, but many patients experience a consistent pattern of symptoms during repeated episodes. Common signs and symptoms of seizures include:

- Temporary confusion or disorientation
- Episodes of staring or loss of awareness
- Stiffening of muscles
- Uncontrolled jerking movements of the limbs
- Loss of consciousness
- Emotional sensations such as fear or anxiety prior to seizure onset[20]



Need for Anticonvulsant Drug Discovery

Despite the availability of numerous antiepileptic drugs (AEDs), there remains a substantial need for safer and more effective therapies. Many currently used AEDs are associated with adverse effects such as **sedation, teratogenicity, cognitive impairment, and long-term toxicity**. [21,22]

Additionally, most conventional treatments focus primarily on controlling seizure symptoms rather than modifying the underlying disease process. A considerable proportion of patients continue to experience **drug-resistant epilepsy**, particularly children and individuals with genetic or structural causes of the disorder. [23]

Therefore, the development of novel anticonvulsant drugs with improved safety profiles, enhanced therapeutic efficacy, and the potential to influence

disease progression remains a major priority in epilepsy research. Identifying new therapeutic agents with **greater specificity, fewer side effects, and better tolerability** is essential for improving the management of epilepsy. [24]

❖ Need of Herbal Plant for Anticonvulsant Drug Discovery:-

Currently available anticonvulsant medications are effective in approximately 75–80% of patients; however, their use is often associated with several adverse effects such as gingival enlargement, excessive hair growth, osteomalacia, sedation, double vision, loss of coordination, and mood disturbances. because of these limitations, herbal-based therapies have gained considerable attention because they are generally associated with fewer side effects. Therefore, there is a growing need to conduct research aimed at developing safer and more effective antiepileptic drugs derived from herbal sources.

List of the Medicinal Plant used for Anticonvulsant Potency

Sr. No	plant	Common name	Part of plant	Extract	Phytochemical constituents	MOA	Refer ences
1	Pongamia pinnata linn	Derris indica	leaves	Ethanollic	flavonoids	It increases Gama Aminobutyric Acid levels in the brain.	25

2	<i>Viola tricolor</i>	Tiranga	leaves	hydroalcoholic	Quercetin, Flavonoids	It works by inhibiting voltage-dependent sodium channels. It targets glutaminergic receptors.	26
3	<i>Carissa carandus</i>	karvanda	leaves	Petroleum ether, Ethyl acetate, ethanol	Saponin, carbohydrates, alkaloids, tannins, steroids, Protein, Amino acids, phenol, flavonoids, Diterpenes	It reduces the influence of GABA on glutamic acid within the brain	27
4	<i>Ocimum santum</i>	Tulsi	leaves	Ethanolic	Flavonoids orientin, vicenin, terpenoids, phenolics, and alkaloids	It blocks voltage-gated sodium channels, helping to better control nerve signals	28
5	<i>Milletia aboensis</i>	Aboens Legume Tree	leaves	Ethanolic	Alkaloids, Tannins, Saponins, flavonoids, phylate, oxalate, glycosides, phenols	-	29
6	<i>Lobelia nicotiana folia</i>	Indian tobacco	leaves	-	Lobeline, piperidine alkaloids	Drugs that activate GABAA receptors or affect GABA synthesis, GABA transport and metabolism help produce an anti-epileptic effect.	30
7	<i>Buddleja polystachya</i>	Butterfly Bush	leaves	methanolic	Iridoids, flavonoids, fatty acids, steroids	It blocks T-type calcium currents and increases GABA signaling.	31
8	<i>Ascotheca paucinervia</i>	<i>Rungia obcordata</i>	leaves	Aqueous	Phenolics and tannins,	It works by blocking the release of glutamate, which is an excitatory neurotransmitter	32
9	<i>Calotropis procera</i>	Madar	leaves	Hydro ethanolic	Flavonoids, phenol	It blocks strychnine-sensitive glycine receptors and increases nerve cell excitability, which helps shorten how often and how long strychnine-induced seizures occur.	33

10	Ginkgo biloba	balkumari	leaves	Ethanolic	flavonoids quercetin, kaempferol and terpenoids ginkgolides, bilobalide	It enhances GABAergic transmission through its action on GABA _A receptors	34
11	Bidens odorata	Blackjack	leaves	Ethanolic	Flavonoids, quercetin, rutin, and glucosides	-	35
12	Morinda lucida	Brimstone tree	leaves	Methanolic	Saponin, tannins, flavonoids, steroids, resin oils	-	36
13	Coccinia grandis	Ivy gourd	leaves	Hydro ethanolic	Alkaloids, flavonoids, tannins saponin	It lowers epileptic activity in the brain by increasing GABA-mediated chloride ion channel opening in GABA _A receptors.	37
14	Ipomoea asarifolia	ginger-leaf morning-glory	leaves	Hexane, ethanol, aqueous	Alkaloids, glycosides, flavonoids, saponins, tannins, phenols and steroids.	it stops sodium channels, attaches to GABA _A receptors, and prevents NMDA-related seizure activity.	38
15	Andrographis paniculata	kalmegh	leaves	Aqueous		Its inhibition of the CYP2C9 enzyme	39
16	<i>Moringa concanensis</i>	Kattu murungai	leaves	ethanolic	alkaloids, saponins, tannins, phenols, flavanoids, and carbohydrates	It may work by blocking sodium, NMDA, and calcium channels, or by acting as a GABA agonist	40
17	Acalypha indica	kuppi	leaves	Methanolic	Alkaloids acalypus and acalypine.	a shortened duration of tonic hind limb extension	41
18	Anacardium occidentale Linn	Cashew	leaves	Methanolic, aqueous	alkaloids, glycosides, tannins, flavonoids, terpenoids, sterols, saponins, mucilage and gum.	increasing inhibition in the brain through GABA	42
19	Acorus calamus Linn	Vacha	leaves	Aqueous	flavonoids, alkaloids, tannins, saponins, glycosides, and phenolic compounds,	regulating GABA-mediated synaptic inhibition	43
20	Afzelia Africana	African mahogany	leaves	Aqueous	flavonoids, alkaloids, tannins,	It considerably reduced the intensity of convulsions and extended their onset	44

						time.	
21	Centella asiatica	Indian pennywort	Leaf	hexane, chloroform, ethyl acetate, butanol, methanol	Triterpenoids saponin like asiaticoside, madecassoside,	-	45
22	Psidium guajava	Guava	leaves	Ethanolic	quercetin saponins	Quercetin interacts with presynaptic calcium channels, producing CNS depressing effect.	46
23	Achyranthes aspera	chaff-flower, Aghada.	Root	Methanolic	flavonoids, saponins, and tannins	It works to prevent seizures by increasing GABAergic neurotransmission.	47
24	Smilax china	Madhusnuhi	Rhizome	Ethanol, hexane, chloroform, ethyl acetate	alkaloids, tannins, flavonoids, saponins and glycosides	It decreases glutamate transmission and increases GABA neurotransmission.	48
25	Cardiospermum halicacabun	Kanphuti, ballon wine	Root	Alcoholic	flavonoids, saponins, tannins, alkaloids, glycosides, steroids	It increases GABAergic-mediated neurotransmission and inhibits voltage-dependent sodium channels to cause tonic-clonic and partial seizures.	49
26	hypericum scabrum L	Kantaron	Aerial part	Aqueous	Flavonoids tannins, hypericin hyperforin	It increases the action of GABA, a chemical that slows down nerve signal transmission.	50
27	Anchusa italica	Italian Bugloss	Flower	Ethanolic	Flavonoids, tannin saponin	Increased nitric oxide generation has been linked to mitochondrial dysfunction in neurons, leading to oxidative stress and increased seizure frequency.	51
28	Harungana madagascariensis	Haronga	seeds	Methanolic	Falvonoids, tannins	It works by blocking GABA transaminase and increasing GABA receptors in the brain.	52

29	Adansonia digitata	Baobab tree	Steam bark	Methanolic	Phenols tannins saponin, flavonoids, terpenoids.	Blocking sodium channels enhances the effects of GABA and prevents the generation of excitatory transmitters.	53
30	morus nigra	Black mulberry	fruit	Methanolic	Flavonoids quercetin and rutin Anthocyanins, Phenolic acids , Tannins , Alkaloids,Saponin s	Strychnine is a nerve toxin that activates the spinal cord by blocking glycine-controlled chloride channels. When it binds to these channels, it interferes with nerve signaling, causing changes in chloride movement and leading to hyperpolarization of the cell.	54

Medicinal Plants with Reported Anticonvulsant Potential

Pongamia pinnata

Pongamia pinnata (synonyms: *Derris indica*, *Pongamia glabra*, *Pongamia pinnata* Merr.) belongs to the family **Fabaceae (Papilionaceae)**. It is a small evergreen tree widely distributed in countries such as India, Bangladesh, China, and Australia. In traditional medicine, the plant has been used for the management of several health conditions. Various pharmacological activities have been reported for *P. pinnata*, including anti-inflammatory, antiplasmodial, antihyperglycemic, antioxidant, antidiarrheal, antiulcer, and antihyperammonemic effects. The plant also exhibits central nervous system depressant activity. In addition, the seed oil of *P. pinnata* is recognized as a potential source of biodiesel and is considered a renewable and environmentally friendly energy resource.[25]

Viola tricolor L.

Viola tricolor L., belonging to the **Violaceae** family, has long been utilized in traditional herbal medicine. Previous studies have demonstrated that this plant possesses several biological activities, including antioxidant, anti-inflammatory, antimicrobial, anticancer, neuroprotective, and anti-ischemic properties. These pharmacological effects are mainly attributed to the presence of bioactive phytochemicals within the plant.[26]

Carissa carandas

Carissa carandas, commonly known as **karvanda**, is a woody climbing shrub belonging to the **Apocynaceae**

family. The plant usually grows to a height of 3–5 meters and is characterized by its dense branches and sharp thorns. Traditionally, it has been used as an astringent, appetizer, and antipyretic, and for the management of thirst, biliousness, and certain neurological conditions. Scientific investigations have reported various pharmacological activities of different parts of the plant, including cardiotoxic, anticonvulsant, neuropharmacological, hepatoprotective, diuretic, antipyretic, and anticancer effects.[27]

Ocimum sanctum

Ocimum sanctum, commonly known as **holy basil or tulsi**, belongs to the **Lamiaceae** family. In Ayurveda, this plant is regarded as a sacred herb and is often referred to as an “elixir of life” due to its wide range of health benefits. It is believed to promote longevity and overall well-being. Pharmacological studies have revealed that *O. sanctum* exhibits numerous therapeutic activities such as analgesic, anticancer, antiasthmatic, antidiabetic, hepatoprotective, hypolipidemic, anti-inflammatory, antioxidant, immunomodulatory, and anti-stress properties.[28]

Millettia aboensis

Millettia aboensis is a woody climbing plant native to tropical regions of Africa, particularly West Africa. It belongs to the **Fabaceae** family and is commonly referred to as **African wisteria** because of its purple flowers resembling those of the wisteria plant. Traditionally, this plant has been used to treat fever, infections, pain, and skin disorders. Some plant parts contain natural compounds capable of stunning fish, and

these compounds are currently being explored for their potential medicinal applications.[29]

Lobelia nicotianifolia

Ethnobotanical surveys indicate that the leaves and inflorescences of *Lobelia nicotianifolia* possess antispasmodic properties and are used traditionally for the treatment of fever, bronchitis, and asthma. In Ayurvedic medicine, the plant is also used for managing back pain and sciatica. The roots have been applied in the treatment of certain eye disorders, while decoctions prepared from the flowers are administered orally for asthma. Leaves are also applied externally to promote wound healing.[30]

Buddleja polystachya Fresen

Buddleja polystachya, belonging to the **Buddlejaceae** family, is a medicinal plant native to East African countries, particularly Ethiopia. In traditional Ethiopian medicine, powdered leaves are taken orally with a local beverage known as *Tej* to eliminate intestinal parasites. Fresh leaves are also used in various regions of Ethiopia for the treatment of malaria and certain eye disorders.[31]

Ascothecha paucinervia

Ascothecha paucinervia is an annual herbaceous plant belonging to the **Acanthaceae** family. The plant can grow up to one meter in height and is characterized by small branches and petioles covered with brown hairs. Its inflorescences are typically axillary and arranged in branched spikes. The plant has been reported in regions such as Gabon and other parts of West Africa. Traditionally, it has been used in fishing due to its **ichthyotoxic properties**.[32]

Calotropis procera

Calotropis procera, commonly known as **rubber bush, giant milkweed, or apple of Sodom**, is a hardy shrub that thrives in arid and semi-arid regions. The plant produces large leaves and a characteristic milky latex. Various parts of the plant have been used traditionally for treating skin diseases, wounds, inflammation, pain, fever, and cough. The leaves are often applied externally to reduce swelling and body pain, while the latex is sometimes used for skin conditions.[33]

Ginkgo biloba

Ginkgo biloba is widely recognized for its medicinal and therapeutic benefits. Extracts prepared from its leaves are commonly used in herbal medicine to enhance blood circulation, improve memory and cognitive performance, and support brain health. The plant is also used to alleviate symptoms such as dizziness that are associated with impaired blood flow.[34]

Bidens odorata Cav.

Bidens odorata, a member of the **Asteraceae** family, has been traditionally used for the treatment of various ailments. It is known for its analgesic, anti-inflammatory, diuretic, and antipyretic properties. The plant has also been used in traditional medicine for respiratory conditions such as cough and bronchitis, as well as for gastrointestinal disorders, renal pain, stomach aches, and certain pulmonary diseases.[35]

Morinda lucida

Morinda lucida, belonging to the **Rubiaceae** family, is an evergreen shrub or small tree that may reach heights of 18–25 meters. The bark varies from smooth to slightly rough and may show grey-brown coloration with purple layers. In traditional Nigerian medicine, the bitter roots are used as chewing sticks and for flavoring food and beverages. Preparations made from the roots, bark, and leaves are used for treating diseases such as malaria, yellow fever, trypanosomiasis, and postpartum fever. The plant has also been employed in managing diabetes, hypertension, diarrhea, ulcers, and stomach pain.[36]

Coccinia grandis

Coccinia grandis, belonging to the **Cucurbitaceae** family, is commonly known as **ivy gourd or scarlet gourd**. The plant has a long history of traditional medicinal use and has been employed in the management of conditions such as diabetes, hypertension, and jaundice. It is also consumed to improve general health and physical strength.[37]

Ipomoea asarifolia

Ipomoea asarifolia, commonly known as **ginger-leaf morning glory**, belongs to the **Convolvulaceae** family. It is a soft-stemmed climbing herb that spreads along the ground or uses nearby plants for support. Traditionally, the plant has been used in the treatment of gynecological disorders, urinary problems during pregnancy, hemorrhage, neuralgia, headaches, arthritic pain, and stomach disorders.[38]

Acalypha indica

Acalypha indica, commonly referred to as **Indian Acalypha**, is a medicinal herb widely distributed across Asia and Africa. Traditionally, it has been used to treat respiratory disorders such as asthma, bronchitis, pneumonia, and cough. The plant is also employed for managing skin conditions including wounds, eczema, and scabies. Preparations made from its leaves, roots, or whole plant are used for digestive problems, infections, diabetes, headaches, and arthritis due to its antioxidant, antimicrobial, anti-inflammatory, and wound-healing properties.[41]

Anacardium occidentale Linn.

Anacardium occidentale (cashew tree), belonging to the **Anacardiaceae** family, has been used traditionally in

many countries including Brazil, India, Malaysia, Mexico, Turkey, and Venezuela. In South Cameroon, it is commonly used as a mouthwash or gargle. The plant has been traditionally employed for treating several conditions such as diabetes, malaria, diarrhea, dysentery, asthma, psoriasis, fever, wounds, toothache, and urinary disorders.[42]

Acorus calamus Linn.

Acorus calamus, a perennial medicinal plant belonging to the **Acoraceae** family, possesses aromatic rhizomes and narrow reed-like leaves. In Ayurveda, the rhizome—known as **Vacha**—has been used as a brain tonic for centuries. Pharmacological studies have reported various biological activities including antibacterial, antidiarrheal, antioxidant, neuroprotective, anticholinesterase, anti-inflammatory, analgesic, and antiulcer properties.[43]

Azelia africana

Azelia africana, a member of the **Leguminosae–Caesalpinioideae** family, is a large tree that can grow up to 33 meters in height and is widely distributed across tropical Africa. Traditionally, the plant has been used in the management of several neurological conditions.[44]

Centella asiatica

Centella asiatica, belonging to the **Apiaceae** family, is commonly known as **Indian pennywort, Asiatic pennywort, or gotu kola**. It grows in tropical regions of Asia, Africa, Australia, and the Pacific islands. Apart from its use as a medicinal herb, the plant is also consumed as a leafy vegetable. Traditionally, it has been used to enhance cognitive function, promote wound healing, and support overall health.[45]

Psidium guajava

Psidium guajava (guava) has been widely used in traditional medicine for the treatment of various ailments including diarrhea, dysentery, skin infections, menstrual disorders, digestive problems, cough, toothache, and bacterial infections. It has also been used in certain neurological conditions such as epilepsy.[46]

Achyranthes aspera

Achyranthes aspera, commonly known as **prickly chaff flower**, is a perennial herb widely distributed in tropical regions. Traditionally, different parts of the plant—including roots, seeds, leaves, flowers, and fruits—have been used in the treatment of various conditions such as eye disorders, menstrual abnormalities, and inflammatory diseases.[47]

Smilax china

Smilax china is a climbing plant belonging to the genus **Smilax**, which includes nearly 300 species of shrubs and vines in the **Liliaceae** family. The plant is distributed across East Asia, North America, and tropical regions worldwide. Traditionally, it has been

used for treating metabolic disorders and inflammatory conditions such as arthritis.[48]

Cardiospermum halicacabum L.

Cardiospermum halicacabum, belonging to the **Sapindaceae** family and commonly known as **Kanphuti**, is widely distributed in warm and humid regions of Asia and Africa, including India. Traditionally, the entire plant has been used for the treatment of rheumatism, snakebite, and joint stiffness. The roots have been used in nervous system disorders, while seeds are believed to promote sweating and reduce fever. In traditional Indian medicine, the roots have also been used for managing epilepsy and anxiety.[49]

Hypericum scabrum L.

Hypericum scabrum, belonging to the **Hypericaceae** family (St. John's wort family), is a perennial herb recognized for its yellow flowers. The plant has been traditionally used for treating inflammation, depression, infections, and spasmodic disorders. It contains bioactive compounds such as flavonoids and phenolic acids and has potential applications in pharmaceutical, cosmetic, and food industries.[50]

Anchusa italica Retz.

Anchusa italica, a member of the **Boraginaceae** family, is a herbaceous flowering plant characterized by rough leaves and bright blue flowers that bloom during summer. Native to parts of Europe and the Mediterranean region, it is sometimes cultivated as an ornamental plant. In traditional medicine, it has been used for its anti-inflammatory and wound-healing properties.[51]

Harungana madagascariensis

Harungana madagascariensis, belonging to the **Hypericaceae** family, is a tropical African plant known for its medicinal properties. Its seeds contain bioactive compounds such as flavonoids and tannins. Although leaves and bark are more commonly used in traditional medicine, the seeds have been utilized for treating wounds, infections, and inflammatory conditions.[52]

Adansonia digitata

Adansonia digitata, commonly known as the **baobab tree**, belongs to the **Malvaceae** family and is widely distributed in Africa. The plant has been traditionally used in the treatment of several conditions including epilepsy and other neurological disorders. Scientific studies have reported antibacterial, anti-inflammatory, analgesic, and antidotal properties in different parts of the plant.[53]

Morus nigra

Morus nigra, commonly known as **black mulberry**, is a flowering plant belonging to the **Moraceae** family and is native to southwest Asia. The fruit consists of

multiple small drupes that become dark purple or black when ripe. Compared with white mulberry, black mulberry has a stronger and richer flavor. The dark coloration of the fruit is due to the presence of **anthocyanins**, which are known for their antioxidant properties.[54]

DISCUSSION

Epilepsy remains one of the most prevalent neurological disorders worldwide and continues to pose a significant challenge in clinical management. Although numerous antiepileptic drugs (AEDs) are currently available, many patients still experience inadequate seizure control or develop adverse effects associated with long-term therapy. In addition, approximately one-third of epilepsy patients are considered drug-resistant, highlighting the need for alternative or complementary therapeutic approaches. Medicinal plants have been widely used in traditional systems of medicine for centuries, and many of them possess bioactive phytochemicals that may contribute to anticonvulsant activity.

The medicinal plants discussed in this review demonstrate diverse pharmacological properties that may be beneficial in the management of seizure disorders. Plants such as *Ocimum sanctum*, *Centella asiatica*, *Acorus calamus*, and *Pongamia pinnata* have shown neuroprotective, antioxidant, anti-inflammatory, and central nervous system depressant effects. These pharmacological activities may play an important role in reducing neuronal excitability and preventing seizure propagation. Similarly, plants like *Carissa carandas*, *Psidium guajava*, and *Bidens odorata* have been reported to exhibit neuropharmacological and anticonvulsant properties in various experimental studies.

Many medicinal plants contain phytoconstituents such as **flavonoids, alkaloids, terpenoids, phenolic compounds, and glycosides**, which are believed to contribute to their anticonvulsant effects. These bioactive compounds may exert their activity through different mechanisms, including modulation of **GABAergic neurotransmission, inhibition of excitatory glutamate pathways, antioxidant protection of neuronal cells, and stabilization of neuronal membranes**. Such mechanisms may help reduce neuronal hyperexcitability, which is a major factor in seizure development.

Furthermore, herbal medicines are generally considered to have fewer side effects compared with conventional synthetic drugs. Their wide availability, affordability, and long history of traditional use make them attractive candidates for the development of new therapeutic agents. However, despite promising preliminary findings, many medicinal plants still require detailed

pharmacological investigations, standardized extraction procedures, toxicity evaluation, and clinical validation.

Therefore, further scientific research is necessary to isolate active phytochemicals, determine their mechanisms of action, and evaluate their safety and efficacy through well-designed experimental and clinical studies. Such investigations could contribute to the discovery of novel plant-derived anticonvulsant drugs that may offer improved therapeutic outcomes for epilepsy patients.

CONCLUSION

Epilepsy is a chronic neurological disorder that significantly affects the quality of life of millions of individuals worldwide. Despite advances in modern pharmacotherapy, the limitations of currently available antiepileptic drugs, including drug resistance and adverse side effects, continue to drive the search for safer and more effective therapeutic alternatives. Medicinal plants represent an important source of bioactive compounds with potential anticonvulsant activity.

The present review highlights several medicinal plants traditionally used for the management of epilepsy and seizure disorders. Many of these plants possess pharmacological properties such as antioxidant, anti-inflammatory, neuroprotective, and central nervous system depressant activities, which may contribute to their anticonvulsant effects. The presence of various phytoconstituents including flavonoids, alkaloids, and phenolic compounds further supports their potential role in seizure control.

Although traditional knowledge provides valuable insights into the therapeutic potential of medicinal plants, scientific validation remains essential. Future research should focus on detailed pharmacological studies, identification of active constituents, toxicity assessments, and clinical trials to establish their efficacy and safety. Such efforts may lead to the development of novel plant-derived antiepileptic drugs with improved therapeutic profiles.

In conclusion, medicinal plants represent a promising area of research in the development of alternative or complementary therapies for epilepsy. Continued exploration of herbal resources may contribute to the discovery of effective and safer anticonvulsant agents for the management of seizure disorders.

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