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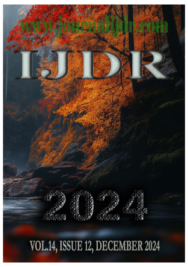

REVIEW ARTICLE OPEN ACCESS

HERBAL REMEDIES FOR EPILEPSY: A COMPREHENSIVE REVIEW

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ABSTRACT

Epilepsy may affect anybody, and 80% of sufferers live in poor nations. This condition causes recurrent paroxysmal episodes and behavioral difficulties. An excitatory-inhibitory imbalance may hypersynchronize neurons. Traditional anticonvulsants may cause drug-resistant epilepsy after decades. ASM-resistant people's relationships, education, and everyday activities are disrupted by seizures. Epilepsy's unpredictability complicates treatment resistance. Since epilepsy has several causes, antidepressants may benefit some but not others. Long, round Aristolochia aspera Anacyclus pyrethrum, Areca catechu, Albizia coriara Welw. Pers. Balsamodendron myrrha, Bryonia alba L., Biophytum petersianum Klotzsch, Bryonia dioica Jacob Bunge added Brassica nigra, Balanites aegyptiaca, Bixa orellana L., Bridelia micrantha, Murray Cuscuta epithymum deodara. The study of 241 epileptic and convulsion botanicals indicated neurological benefits. Lamiaceae dominated the 97 epilepsy-curing plant groups. Researchers chose antiepileptic herbs simpler. Herbal remedies may combat neurodegeneration, neuroinflammatory processes, and anomalies, according to research. Study and validation may enhance antiepileptics over allopathic.

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INTRODUCTION

People of all ages are affected by the neurological disorder known as epilepsy, and at least 80% of those who have it live in underdeveloped or low-resource countries (Beghi, 2020). According to (Fiest *et al*. 2017), there are 61.4 cases of epilepsy for every 100,000 persons globally. The hallmark of epilepsy is recurrent paroxysmal episodes marked by standardized behavioral abnormalities that reflect the brain mechanisms that underlie epilepsy (Fisher *et al*., 2017). A disproportion between the excitatory and inhibitory systems neurotransmitters may be the reason, while the exact explanation is unknown (Fokoua *et al*., 2021).This complex neurotransmitter mechanism, which is often linked to this imbalance, involves the GABAergic, glutamatergic, and cholinergic systems (da Guedes *et al*., 2022). Numerous drugs have been used to treat epilepsy. Some of the side effects of these drugs are potentially lethal (Tang *et al*., 2017; Herrera-Calderon *et al*., 2018). Once again, according to (Brodie *et al*. 2016), over 25% of individuals on antiepileptic drugs are resistant to standard pharmacological treatments. This calls for the creation of innovative drugs that are effective and have little or no side effects, especially those made from natural ingredients.

Epilepsy: A Pathophysiological Insight- A disproportion between the excitatory and inhibitory systems neuronal impulses causes neuron hyperexcitability and hypersynchrony in epilepsy. This is mostly because: Overactive glutamate signaling and poor GABA-mediated inhibition are the two factors thatinduce neuronal hyperexcitability by contributing to it.

Mutations in sodium, potassium, or calcium channels that affect normal neuronal firing are referred to as ion channel abnormalities. Aberrant synaptic plasticity and coordinated activity of brain networks are examples of network alterations. Inflammatory processes and disruption to the blood-brain barrier both contribute to an increase in excitability. Also known as neuroinflammation and BBB dysfunction. Changes in Structure Neurodegeneration, such as hippocampal sclerosis, is a factor that leadsfor the development of epilepsy that lasts for a long time.

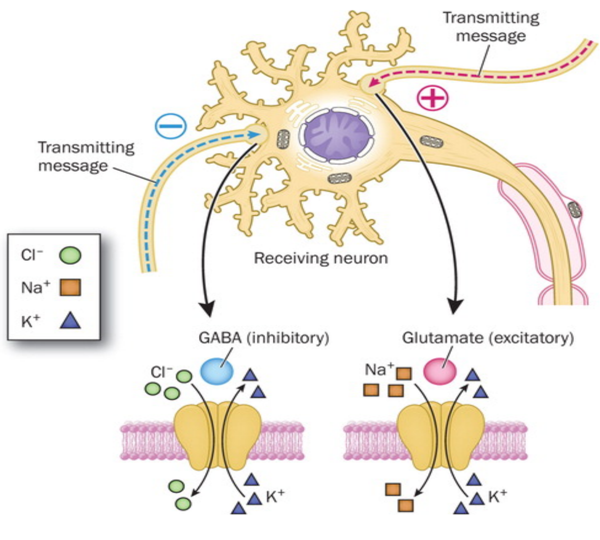

Figure 1. Pathophysiology of epilepsy

Neurotransmitter Imbalance

Table 1. Neurotransmitter Imbalance

Neurotransmitter Imbalance	Role in Epilepsy
Glutamate	Excessive excitation.
GABA	Impaired inhibitory control.
Acetylcholine	May facilitate seizure spread.
Serotonin & Dopamine	Modulation of seizure threshold.

Epilepsy Management Strategies That Have Been Used Traditionally: Traditional ASMs have been available. primary epilepsy treatment for decades, offering considerable relief to many patients (Ghosh, Mishra *et al*., 2023 & 2021). ASMs reduce seizures by regulating neuron excitability and preventing aberrant electrical activity (Rogawski *et al.,* 2016) New drugs have transformed epilepsy therapy, enabling for many people, seizure control and an improvement in their quality-of-lifepersons with epilepsy (Baker, GA. *et al*., 1997). ASMs target particular pathways in seizure development and transmission using different types (Baftiu *et al*., 2019). Phenytoin, carbamazepine, valproate, lamotrigine, and levetiracetam are examples of ASMs that are often used during this time (Asconape *et al.,* 2022). The prescription of these medications depends on the patient's seizure type, epilepsy syndrome, age, and general health. ASMs are widely used and successful in many individuals, but they have limitations that might hamper epilepsy therapy. Not all patients react well to standard ASMs, resulting in drug-resistant epilepsy. Despite many ASM trials, almost one-third of epileptic patients still have seizures (Walia, Stevelink *et al*., 2004, 2019). Alternative treatment techniques are needed to address drug-resistant epilepsy, since this syndrome presents a considerable clinical problem.

***Seizure Control Issues with Traditional Therapies*:** Epilepsy therapy is complicated by drug-resistant epilepsy (Schmidt *et al,* 2005). Patients who are resistant to standard ASMs have recurring seizures, affecting everyday life, social relationships, and educational and job chances (Nickels, Camfield *et al*., 2016, 2014). Seizures may cause worry, despair, and worse quality of life due to their unpredictability. Treatment resistance in epilepsy has complicated and multiple causes. The intrinsic heterogeneity in epilepsy is a substantial problem. The etiology and mechanism of the illness vary widely across patients due to its heterogeneity. ASMs may not be successful for all patients owing to variances in brain structure and function, making it difficult to obtain consistent seizure control with standard therapy (Laxer, Duncan *et al*., 2014, 2006). The variety of epilepsy subtypes, seizures, and reactions.

Traditional therapies provide a number of obstacles when it comes to achieving seizure control: Patients who are resistant to standard anticonvulsant medications (ASMs) are at risk of experiencing repeated seizures, which may have a significant effect on their day-to-day life, disturb their social relationships, and restrict their possibilities for education and work . Due to the unpredictability of seizures, individuals may experience feelings of worry and sadness, as well as a decline in their general quality of life. The causes for treatment resistance in epilepsy are complicated and include a number of different different factors. Epilepsy is characterized by its intrinsic variability, which presents a substantial difficulty. The disorder is diverse, and the underlying reasons and processes may vary widely from one patient to another. This is what makes the condition so prevalent. As a consequence of this, antidepressants that are powerful for some people may not be as helpful for others owing to the fact that the structure and function of the brain are different for each person .The variety of epilepsy subtypes, seizure kinds, and reactions that may be experienced.

METHODOLOGY

First, articles on medicinal plants as antiepileptic agents were searched and downloaded using keywords from PubMed, Medline, Web of Science, Google Scholar, and ScienceDirect. Keywords included Herbal plants, medicinal plants, antiepileptics, anticonvulsants, prevalence, and epidemiology are all terms that are used to describe plants. After reviewing each publication, the beneficial medicinal herbs for epilepsy were compiled and calculated (Table 2). Local folk medicine users, traditional healers, and elderly individuals with herbal plant expertise provided information on the usage and uses of these herbs in epilepsy.

1. Bacopa monnieri (L.) Wettst

Common Name: Brahmi, Family: Plantaginaceae, Part Used: Whole plant

Active Compounds:

- Bacosides A and B (saponins)
- Alkaloids (brahmine, herpestine)
- Flavonoids

Mechanism of Action: The reduction of oxidative stress and lipid peroxidation in the brain constitutes the neuroprotective characteristics of this substance. Helps to improve synaptic communication and encourages the restoration of neurons that have been injured. Increases the activation of GABAergic receptors, which contributes to the anticonvulsant effects of the drug.

2. Centella asiatica (L.) Urban

Common Name: Gotu Kola, Family: Apiaceae, Part Used: Leaves
Active Compounds:

- Asiaticoside, madecassoside (triterpenes)
- Flavonoids (quercetin)

Mechanism of Action: Increases the antioxidant defenses of the body by increasing the activity of enzymes such as catalase and superoxide dismutase. Improves brain health by lowering the amount of oxidative stress that occurs during seizures.

3. Withania somnifera (L.) Dunal

Common Name: Ashwagandha, Family: Solanaceae, Part Used: Root
Active Compounds:

- Withanolides (steroidal lactones)
- Alkaloids (isopelletierine, anaferine)

Mechanism of Action: In order to minimize seizures that are caused by stress, this medication modifies the hypothalamic-pituitary-adrenal axis. The activation of GABA receptors is increased, which results in the neuroprotective effects of this substance.

4. Acorus calamus L.

Common Name: Sweet Flag, Family: Acoraceae, Part Used: Rhizome
Active Compounds:

- β-asarone (volatile oil)
- Eugenol

Mechanism of Action: GABAergic neurotransmission is improved, which results in a reduction in seizure activity. Provides neuroprotection by reducing the destructive effects of oxidative stress and inflammation.

5. Nardostachys jatamansi DC.

Common Name: Spikenard, Family: Caprifoliaceae, Part Used: Rhizome

Active Compounds:

- Jatamansone (sesquiterpenes)
- Lignans

Table 2. Traditional epilepsy therapy plants

3	Plant	Family	Family	Part used	Mode of Action	References
1	Bacopa monnieri (L.) Wettst.	Brahmi	Plantaginaceae	Whole plant	Characterized by neuroprotective and antioxidant effects, it improves cognitive performance.	(Bhandari Kumar *et al.,* 2015).
2	Withania somnifera (L.) Dunal	Ashwagandha	Solanaceae	Root	Adaptogenic may assist in the reduction of seizures that are caused by stress.	(Mirjalili M. H., *et al.* 2009).
3	Centella asiatica (L.) Urban	Gotu Kola	Apiaceae	Leaves	cognitive enhancement, neuroprotective properties, and a reduction in oxidative stress are also among its benefits.	(Orhan I.E. *et al.,* 2012).
4	Acorus calamus L.	Sweet Flag	Acoraceae	Rhizome	Because of its interaction with GABAergic circuits, it has anticonvulsant properties.	(Rao V. S., et al. 2008).
5	Nardostachys jatamansi DC.	Spikenard	Caprifoliaceae	Rhizome	This substance has sedative and anticonvulsant properties, and it also reduces oxidative stress in the brain.	(Rajasankar S., *et al.,* 2009).
6	Valeriana officinalis L.	Valerian	Caprifoliaceae	Root	This substance has sedative and anticonvulsant actions, and it also raises the levels of GABA in the brain.	(Marder M., *et al.,*2003).
7	Ocimum sanctum L.	Holy Basil (Tulsi)	Lamiaceae	Leaves	It has neuroprotective and antioxidant properties, and it helps prevent stress and seizures.	(Kothari S. K., *et al.,* 2004).
8	Rauvolfia serpentina (L.) Benth. ex Kurz	Indian Snakeroot	Apocynaceae	Root	The substance contains reserpine, which is known to have both sedative and anticonvulsant effects.	(Shah V., *et al.,* 2011).
9	Moringa oleifera Lam.	Drumstick Tree	Moringaceae	Leaves, seeds	Having antioxidant and anti-inflammatory properties, as well as perhaps neuroprotective properties	(Stohs S. J., *et al.,* 2015).
10	Celastrus paniculatus Willd. Celastraceae Seeds	Intellect Tree	Celastraceae	Seeds	has neuroprotective and cognitive-enhancing qualities; in experimental experiments, it has been shown to lessen the frequency of seizures.	(Bhatt R., *et al.,* 2009).

Mechanism of Action: Depresses the central nervous system (CNS) while also having sedative and anticonvulsant effects. Through its interaction with ion channels, it serves to inhibit neuronal hyperexcitability.

6. Valeriana officinalis L.

Common Name: Valerian, Family: Caprifoliaceae, Part Used: Root
Active Compounds:

- Valerenic acid
- Isovaleric acid

Mechanism of Action: Inhibits the breakdown of GABA, which results in an increase in its availability in the brain. While epileptic episodes are occurring, it reduces the hyperexcitability of neurons.

7. Ocimum sanctum L.

Common Name: Holy Basil (Tulsi), Family: Lamiaceae, Part Used: Leaves

Active Compounds:

- Eugenol, ursolic acid
- Flavonoids (orientin, vicenin)

Mechanism of Action: Inhibits the breakdown of GABA, which results in an increase in its availability in the brain. While epileptic episodes are occurring, it reduces the hyperexcitability of neurons.

8. Rauvolfia serpentina (L.) Benth. ex Kurz

Common Name: Indian Snakeroot, Family: Apocynaceae, Part Used: Root

Active Compound

- Reserpine (alkaloid)
- Ajmaline, serpentine

Mechanism of Action: Properties that are sedative and antihypertensive, which may be helpful in the treatment of seizures caused by stress. Dopamine and serotonin pathways in the brain are controlled by this substance.

9. Moringa oleifera Lam

Common Name: Drumstick Tree, Family: Moringaceae , Part Used: Leaves, seeds

Active Compound

- Quercetin, chlorogenic acid
- Glucosinolates

Mechanism of Action: Neurons are protected from harm caused by seizures by qualities that include antioxidants and anti-inflammatory agents. Could potentially improve the operation of mitochondria and the metabolism of energy in the brain.

10. Celastrus paniculatus Willd.

Common Name: Intellect Tree, Family: Celastraceae, Part Used: Seeds

Active Compound

- Sesquiterpenoids
- Alkaloids

Mechanism of Action: Increases neuronal function while simultaneously decreasing excitotoxicity. Reduces the frequency of seizures as well as their intensity.

RESULTS

On the basis of the bioactive chemicals and modes of action that they had, the herbal plants that were examined shown a substantial promise for the treatment of epilepsy. Among the critical remarks are:

- **GABAergic Modulation:** Numerous herbs, including Valeriana officinalis (Valerian) and Acorus calamus (Sweet Flag), exert their effects by boosting the activity or availability of GABA, which is the principal inhibitory neurotransmitter in the brain and is essential for the regulation of seizures.
- Bacopa monnieri (also known as Brahmi) and Centella asiatica (also known as Gotu Kola) are two examples of plants that have been shown to possess antioxidant and anti-inflammatory qualities. These features have been shown to reduce neuronal damage and oxidative stress that are linked with epilepsy.
- **Cognitive and Stress Management:** Herbs such as Withania somnifera (Ashwagandha) and Nardostachys jatamansi (Spikenard) are effective in managing comorbidities of epilepsy, such as cognitive impairment and stress, both of which have the potential to worsen seizure activity.
- **Sedative Effects:** The sedative characteristics that have been identified in Valeriana officinalis and Rauvolfia serpentina (Indian Snakeroot) assist to control excitability in the nervous system, which in turn reduces the frequency and intensity of seizures.
- **Historically Employed** The historic usage of these herbs in Ayurveda and other medical systems is supported by preclinical and limited clinical research, which emphasize their anticonvulsant effect. Validation: These plants have been used therapeutically for centuries.

CONCLUSION

There are several kinds of neurodegenerative and neuroinflammatory pathways that may be reversed and aberrant diseases corrected by using medicinal compounds that are derived from herbs, which are key sources of these agents. According to the findings of this analysis, there are 241 plants that are beneficial in treating neurological disorders, with a particular emphasis on epilepsy and convulsions. These data may be further confirmed and researched for the purpose of discovering new and optimal alternative therapies to the current allopathic antiepileptic medications. These treatments should have maximum effectiveness, excellent tolerability, lowest interactive level, and minimal adverse drug response.

REFERENCES

Asconapé, J. J. 2002. Some common issues in the use of antiepileptic drugs. In *Seminars in neurology* (Vol. 22, No. 01, pp. 027-040). Copyright© 2002 by Thieme Medical Publishers, Inc., 333 Seventh Avenue, New York, NY 10001, USA. Tel.:+ 1 (212) 584-4662.

Baker, G. A., Jacoby, A., Buck, D., Stalgis, C., & Monnet, D. 1997. Quality of life of people with epilepsy: a European study. *Epilepsia*, *38*(3), 353-362.

Baftiu, A., Lima, M. H., Svendsen, K., Larsson, P. G., Johannessen, S. I., & Landmark, C. J. (2019). Safety aspects of antiepileptic drugs—a population-based study of adverse effects relative to changes in utilisation. *European Journal of Clinical Pharmacology,* 75, 1153-1160.

Beghi, E., Carpio, A., Forsgren, L., Hesdorffer, D. C., Malmgren, K., Sander, J. W., ... & Hauser, W. A. 2010. Recommendation for a definition of acute symptomatic seizure. *Epilepsia*, *51*(4), 671-675.

Bhandari, R., & Kumar, R. 2015. Herbal remedies for epilepsy. *Indian Journal of Pharmaceutical Sciences.*

Bhatt, R., Gupta, A., Sharma, S. K., & Singh, S. 2009. Celastrus paniculatus: A neuroprotective agent.

Brodie, M. J., Besag, F., Ettinger, A. B., Mula, M., Gobbi, G., Comai, S., ... & Steinhoff, B. J. 2016. Epilepsy, antiepileptic drugs, and aggression: an evidence-based review. *Pharmacological reviews*, *68*(3), 563-602.

Camfield, P. R., & Camfield, C. S. 2014. What happens to children with epilepsy when they become adults? Some facts and opinions. *Pediatric neurology*, *51*(1), 17-23.

Da Guedes, E., Ribeiro, L. R., Carneiro, C. A., Santos, A. M. F., Brito Monteiro, Á., De Andrade, H. H. N., ... & Stiebbe Salvadori, M. G. 2022. Anticonvulsant Activity of trans-Anethole in Mice. *BioMed Research International*, *2022*(1), 9902905.

Duncan, J. S., Sander, J. W., Sisodiya, S. M., & Walker, M. C. 2006. Adult epilepsy. *The Lancet*, *367*(9516), 1087-1100.

Fiest, K. M., Sauro, K. M., Wiebe, S., Patten, S. B., Kwon, C. S., Dykeman, J., ... & Jetté, N. 2017. Prevalence and incidence of epilepsy: a systematic review and meta-analysis of international studies. *Neurology*, *88*(3), 296-303.

Fisher, R. S., Cross, J. H., French, J. A., Higurashi, N., Hirsch, E., Jansen, F. E., ... & Zuberi, S. M. 2017. Operational classification of seizure types by the International League Against Epilepsy: Position Paper of the ILAE Commission for Classification and Terminology. *Epilepsia*, *58*(4), 522-530.

Fisher, R. S., Cross, J. H., French, J. A., Higurashi, N., Hirsch, E., Jansen, F. E., ... & Zuberi, S. M. 2018. Operational classification of seizure types by the International League Against Epilepsy: position paper of the ILAE Commission for Classification and Terminology. *Zeitschrift für Epileptologie*, *31*, 272-281.

Fokoua, A. R., Ndjenda II, M. K., Wuyt, A. K., Bomba, F. D. T., Dongmo, A. K., Chouna, R., ... & Nguelefack, T. B. 2021. Anticonvulsant effects of the aqueous and methanol extracts from the stem bark of Psychotria camptopus Verdc.(Rubiacaea) in rats. *Journal of Ethnopharmacology*, *272*, 113955.

Ghosh, S., Sinha, J. K., Ghosh, S., Sharma, H., Bhaskar, R., & Narayanan, K. B. 2023. A comprehensive review of emerging trends and innovative therapies in epilepsy management. *Brain Sciences*, *13*(9), 1305.

Kothari, S. K., Mishra, V., & Bhattacharya, A. K. 2004. Ocimum sanctum: A multifunctional medicinal plant. *Indian Journal of Experimental Biology*

Laxer, K. D., Trinka, E., Hirsch, L. J., Cendes, F., Langfitt, J., Delanty, N., ... & Benbadis, S. R. 2014. The consequences of refractory epilepsy and its treatment. *Epilepsy & behavior*, *37*, 59-70.

Marder, M., Viola, H., Wasowski, C., Fernández, S., & Medina, J. H. 2003. Valerian and GABA mechanisms: A review. *Progress in Neuropsychopharmacology & Biological Psychiatry.*

Mirjalili, M. H., Moyano, E., Bonfill, M., Cusidó, R. M., & Palazón, J. 2009. Withania somnifera and its health benefits. *Journal of Medicinal Plants Research*

Mishra, P., Sinha, J. K., & Rajput, S. K. 2021. Efficacy of Cicuta virosa medicinal preparations against pentylenetetrazole-induced seizures. *Epilepsy & Behavior*, *115*, 107653.

Nickels, K. C., Zaccariello, M. J., Hamiwka, L. D., & Wirrell, E. C. 2016. Cognitive and neurodevelopmental comorbidities in paediatric epilepsy. *Nature Reviews Neurology*, *12*(8), 465-476.

Orhan, I. E. 2012. Centella asiatica: A plant with therapeutic potential in neurological disorders. *Fitoterapia.*

Rajasankar, S., Krishnan, V., & Venkatesh, G. 2009. Nardostachys jatamansi: Pharmacological insights into its use for epilepsy. *Journal of Ethnopharmacology.*

Rao, V. S., Santos, F. A., & Oliveira, A. F. 2008. Acorus calamus: Traditional uses and pharmacological activity. *Phytomedicine*

Rogawski, M. A., Löscher, W., & Rho, J. M. 2016. Mechanisms of action of antiseizure drugs and the ketogenic diet. *Cold Spring Harbor perspectives in medicine*, *6*(5), a022780

Schmidt, D., & Löscher, W. 2005. Drug resistance in epilepsy: putative neurobiologic and clinical mechanisms. *Epilepsia*, *46*(6), 858-877.

Shah, V., Patel, P., & Gandhi, T. 2011. Rauvolfia serpentina in epilepsy treatment. *Pharmacognosy Reviews.*

Stevelink, R., Koeleman, B. P. C., Sander, J. W., Jansen, F. E., & Braun, K. P. J. 2019. Refractory juvenile myoclonic epilepsy: a meta-analysis of prevalence and risk factors. *European journal of neurology*, *26*(6), 856-864.

Stohs, S. J., & Hartman, M. J. 2015. Moringa oleifera: Antioxidant and neuroprotective properties. *Phytotherapy Research.*

Tang, F., Hartz, A. M., & Bauer, B. 2017. Drug-resistant epilepsy: multiple hypotheses, few answers. *Frontiers in neurology*, *8*, 301

Walia, K. S., Khan, E. A., Ko, D. H., Raza, S. S., & Khan, Y. N. 2004. Side effects of antiepileptics—a review. *Pain practice*, *4*(3), 194-203.

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