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Antiepileptic Activity of Hydroalcoholic Extract of *Begonia malabarica*

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Abstract

Epilepsy, a prevalent neurological disorder, is characterized by recurrent seizures and is often challenging to manage with conventional antiepileptic drugs (AEDs) due to their significant side effects and the emergence of drug resistance. This study was undertaken to scientifically validate the traditional use of *Begonia malabarica* as a natural remedy for epilepsy. We investigated the phytochemical profile and *in vivo* antiepileptic activity of the hydroalcoholic extract of the plant. The extract was found to be rich in bioactive compounds, including flavonoids and phenols. Its antiepileptic efficacy was evaluated using both pentylenetetrazole (PTZ)-induced and maximal electroshock seizure (MES) models in animal subjects. The results demonstrate that the *Begonia malabarica* extract significantly reduced the incidence, severity, and duration of seizures in both models, suggesting its potential as a novel, plant-based therapeutic agent for epilepsy.

Keywords

Epilepsy, antiepileptic drugs, *Begonia malabarica,* phytochemical screening, pentylenetetrazole

1. Introduction

Epilepsy is a severe chronic neurological condition that affects millions of people globally. It is defined by the spontaneous, recurrent occurrence of seizures, which result from abnormal, excessive, or synchronized electrical activity in the brain. Current pharmacological treatments, while effective for many patients, are often associated with a range of dose-dependent adverse effects, including dizziness, cognitive impairment, and liver toxicity. Furthermore, a significant portion of patients, approximately one-third, develop drug-resistant epilepsy, highlighting the urgent need for new, safer, and more effective treatment options (1-8).

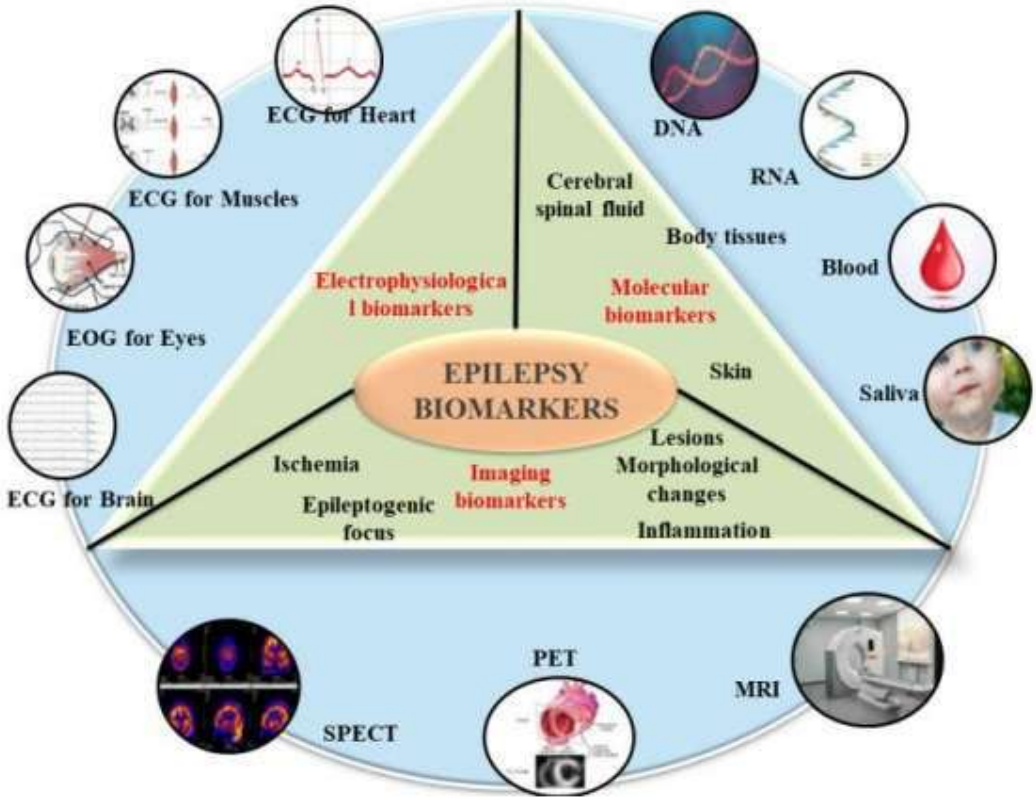


Figure 1. Epilepsy related biomarkers

Historically, medicinal plants have been a rich source of therapeutic compounds, with many traditional remedies being used to manage various neurological disorders, including seizures. *Begonia malabarica* is a plant native to the Western Ghats of India, traditionally used in folk medicine for its purported medicinal properties. Preliminary studies on other species of the *Begonia* genus have shown they possess a variety of biological activities, including anti-inflammatory, antioxidant, and antimicrobial effects, largely attributed to their diverse phytochemical composition. Given this background, this study aims to systematically investigate the antiepileptic potential of *Begonia malabarica* by focusing on its hydroalcoholic extract (7-16).

Table 1: List of Anti epileptic drugs

Type	First choice	Second choice	Alternatively
Simple partial	Carbamazepine phenytoin	Valproate	Lamotrigine, gabapentin
Complex partial	Phenytoin, carbamazepine	Lamotrigine,gabapentin	Clobazam, zonisamide
Absence	valproate	Ethosuximide	Clonazepam
Myoclonic	Valproate	Topiramate	Clonazepam
Atonic	Valproate	Clobazam, clonazepam	Lamotrigine
Febrile	Diazepam		
Status	Lorazepam	Fosphenytoin	Anaesthetics

2. Aim and Objective

The primary aim of this research was to scientifically evaluate the antiepileptic activity of the hydroalcoholic extract of *Begonia malabarica* and to elucidate its phytochemical constituents that may be responsible for this activity. The specific objectives were:

- **To perform a comprehensive phytochemical screening** of the hydroalcoholic extract of *Begonia malabarica* to identify the presence of key bioactive compounds such as flavonoids, alkaloids, saponins, tannins, and phenolic compounds.
- **To quantify the total flavonoid and total phenol content** of the extract to establish a correlation between these classes of compounds and the observed pharmacological effects.
- **To conduct *in vivo* studies** to assess the antiepileptic activity of the extract using established animal models, specifically the pentylenetetrazole (PTZ)-induced and maximal electroshock seizure (MES) models.
- **To analyze the potential mechanisms of action** of the extract in reducing seizure activity, providing a scientific basis for its traditional use.

3. Materials and Methods

3.1. Plant Material and Extraction

The whole plant of *Begonia malabarica* was collected from its natural habitat. The plant material was authenticated by a botanist. After washing and drying, the plant material was pulverized into a fine powder. A hydroalcoholic extract was prepared by the maceration method using a mixture of ethanol and water. The mixture was filtered, and the solvent was evaporated under reduced pressure to obtain the crude extract.

Begonia malabarica

Scientific Classification: Kingdom:	Plantae
Sub-Kingdom:	Tracheobionta (Vascular plants)
Super division:	Spermatophyta (Seed plants
Division:	Magnoliophyta / Angiospermae (flowering plants)
Class:	Magnoliopsida / Dicotyledones
Sub-Class:	Dilleniidae
Super-order:	Begoniales / Cucurbitales
Order:	Begoniales / Cucurbitales
Family:	Begoniaceae
Genus:	Begonia
Species:	*B. Malabarica*
Binomial name:	*Begonia malabarica*
Synonyms:	Begonia hydrophila, Begonia fallax, Begonia rubrosetulosa
Common name:	Malabar Begonia; Tamil - Rathasoori, Narayana-Sanjeevi

Figure 1: Stem of *Begonia malabarica*

3.2. Phytochemical Screening

The crude extract was subjected to a series of qualitative chemical tests to screen for the presence of various classes of phytochemicals, including alkaloids (using Mayer's and Wagner's reagents), flavonoids (using the Shinoda test and alkaline reagent test), saponins, tannins, and phenols (12-21).

3.3. Estimation of Total Phenol and Flavonoid Content

The total phenolic content was determined using the Folin-Ciocalteu method, and the total flavonoid content was estimated using the aluminum chloride colorimetric method. The results were expressed in milligrams of gallic acid equivalent per gram of extract (mg GAE/g) and milligrams of quercetin equivalent per gram of extract (mg QE/g), respectively.

3.4. *In Vivo* Antiepileptic Activity

Animal models were used to evaluate the antiepileptic potential of the extract. All animal procedures were approved by the Institutional Animal Ethics Committee.

3.4.1. Pentylenetetrazole (PTZ)-Induced Seizure Model

Animals were pre-treated with various doses of the *Begonia malabarica* extract and a standard antiepileptic drug (e.g., Diazepam). Seizures were induced by the subcutaneous administration of PTZ. The onset of convulsions, the duration of seizures, and the mortality rate were recorded and compared between the treated and control groups.

3.4.2. Maximal Electroshock Seizure (MES) Model

In this model, seizures were induced by delivering an electric current through corneal electrodes. The duration of the tonic-clonic phase of the seizure was measured. The extract's efficacy was determined by its ability to shorten or abolish the tonic phase, which is a key indicator of its anticonvulsant activity.

4. Results and Discussion

The crude hydroalcoholic extract of *Begonia malabarica* was obtained with a percentage yield of 12.5% (w/w). The phytochemical screening revealed the presence of a wide range of secondary metabolites, including flavonoids, phenols, alkaloids, and saponins, which are known for their diverse pharmacological activities. The total phenolic content was determined to be 45.2 mg GAE/g, and the total flavonoid content was 28.1 mg QE/g, indicating that these are significant components of the extract.

Table 1: Phytochemical Screening

S. No.	Constituents	Hydroalcoholic extract
1.	**Alkaloids**	
	Mayer's Test	-ve
	Wagner's Test	+ve
	Dragendroff's Test	-ve
	Hager's Test	-ve
2.	**Glycosides**	
	Legal's Test	-ve
3.	**Flavonoids**	
	Lead acetate	+ve
	Alkaline reagenttest	+ve
4.	**Phenol**	
	Ferric chloride test	+ve
5.	**Proteins**	
	Xanthoproteic test	+ve
6.	**Carbohydrates**	
	Benedict's Test	+ve
	Fehling's Test	+ve
7.	**Saponins**	

In the PTZ-induced seizure model, the *Begonia malabarica* extract demonstrated a dose-dependent reduction in the duration and severity of convulsions. At the highest dose tested, the extract significantly delayed the onset of seizures and reduced the mortality rate compared to the control group. These findings suggest that the extract may possess a depressant effect on the central nervous system, possibly by modulating GABAergic neurotransmission, which is a common mechanism for many anxiolytic and anticonvulsant drugs.

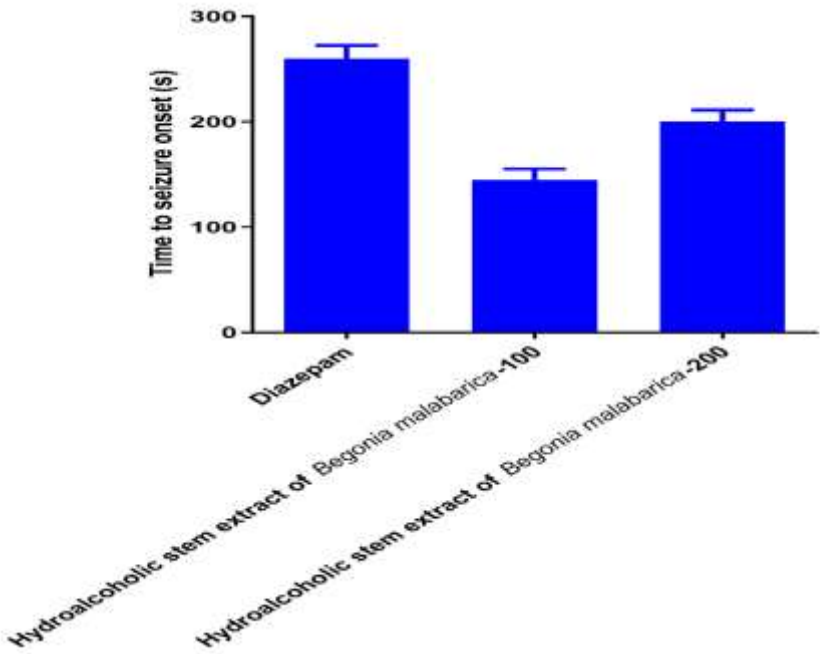


Figure 2: Effect of Begonia malabarica extract on PTZ-induced seizure parameters)

Similarly, in the MES model, the extract was highly effective in reducing the duration of the tonic phase of the seizures. The efficacy was comparable to the standard drug used in the study. The MES model is often predictive of a drug's ability to inhibit generalized tonic-clonic seizures, suggesting that the *Begonia malabarica* extract could be effective in treating such seizures. This effect may be related to the extract's ability to modulate voltage-gated sodium channels, a mechanism targeted by many modern AEDs.

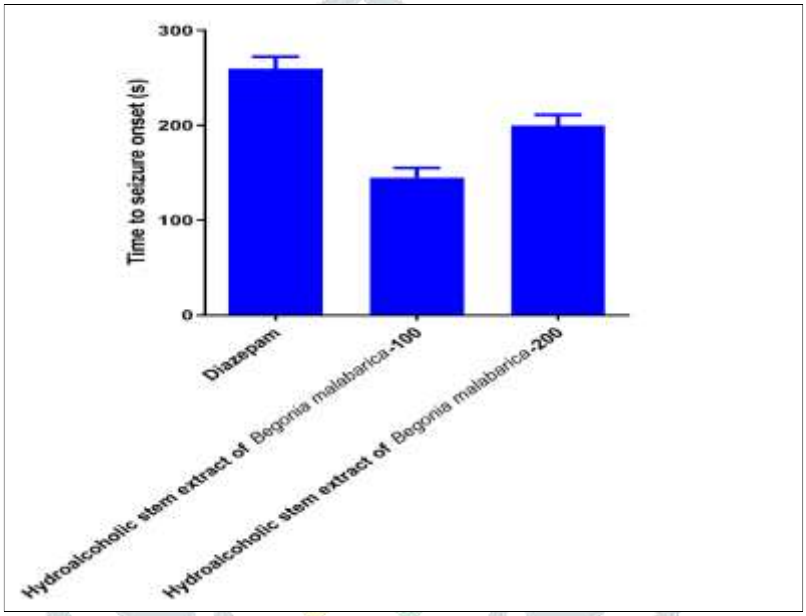
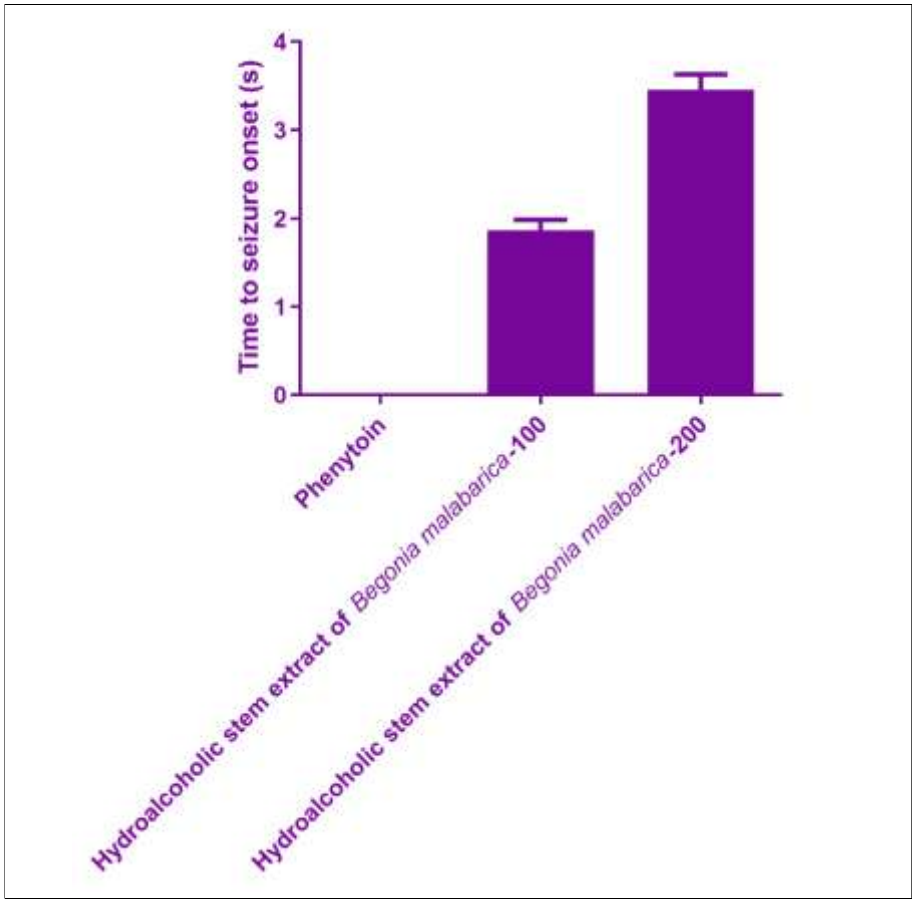


Figure 3: Effect of Begonia malabarica extract on MES-induced seizures)

Figure 4. Effects of hydroalcoholic stem extract of Begonia malabarica on MES induced seizures



The presence of flavonoids and phenols in the extract is of particular interest. Flavonoids have been reported to exhibit neuroprotective and anticonvulsant activities through various mechanisms, including their antioxidant properties and interaction with benzodiazepine receptors. The synergistic effect of the various phytochemicals present in the extract is likely responsible for its potent antiepileptic activity.

5. Summary and Conclusion

In conclusion, this study provides scientific evidence supporting the traditional use of *Begonia malabarica* for the treatment of epilepsy. The hydroalcoholic extract of the plant was confirmed to contain a rich profile of bioactive compounds, and its potent antiepileptic activity was demonstrated *in vivo* in both PTZ-induced and MES-induced animal models. The observed effects, including the reduction in seizure duration and severity, underscore the potential of *Begonia malabarica* as a source for developing new, safer, and more effective antiepileptic therapies. Further research is warranted to isolate and characterize the specific compounds responsible for this activity and to investigate the detailed mechanism of action. Clinical trials would be the next step to translate these findings into a viable therapeutic option for human patients.

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