

Anticonvulsant Activity in Herbal Extract

Davinaa Jayasilan

Saveetha Dental College

Abstract: *With the rapidly developing technology in medicine various anticonvulsant drugs or more accurately called as antiepileptics are made available to prevent epilepsy and seizures . However, the unwanted side effects of the available drugs such as nausea, drowsiness, ataxia, mental dullness, paresthesia, hematologic changes, hirsutism, weight gain, hypertrophy of gums, teratogenesis, and congenital malformations are becoming a serious concern. Therefore, research are being vastly conducted to discover anticonvulsant activity in herbal medicine and their antiepileptic efficacy.*

Keywords: Herbal, Medicine, Anti-Convulsion

1. Introduction

Epilepsy is a neurological disorder affecting more than 50 million people worldwide. Cases are highest among children below 7 years old and people above 55 years. Although there are so many anticonvulsant medicines available, seizure remains uncontrolled in 20% of patients. There are various medicinal plants used in traditional medicine in India, Africa, China and other nations as anticonvulsants such as *Cardiospermum halicacabum* (The Balloon plant), *Annona senegalensis* (African custard apple), *Ricinus communis* (Castor), *Vitellaria paradoxa* (Shea Tree), *Ocimum gratissimum* (Clove Basil), *Swertia* (felworts), *Dendrophthoe falcate* (Honey Suckled Mistletoe), *Hypoxis hemerocallidea* (African star grass, African potato) and etc. The roots, leaves, bark, flowers or seeds of these medicinal plants are being used as anticonvulsants. Medicinal plants are believed to be an essential source of new chemical substances possessing potential therapeutic effects.

2. Anticonvulsant Activity in Plants

Anticonvulsant activity means it has the ability to suppress the rapidly excessive firing of neurons that leads to seizure. Thus, preventing the spread of the seizure within the brain and protection against any possible effects which may lead to brain damage. The mechanism of action of conventional anticonvulsant drugs is by blocking sodium channels or increasing the function of γ -aminobutyric acid. Besides sodium channels and GABA system, GABAA receptors, the GAT-1 GABA transporter, and GABA transaminase, voltage-gated calcium channels are also targets.

The diverse amount of herbal plants possessing anticonvulsant activity are extensively being researched upon. For example, *Cardiospermum halicacabum* L. (The balloon plant or known as 'Kanphuti'). [1] Phytochemical examination of the extracts of the plant species *Cardiospermum halicacabum* showed the presence of glycosides, steroids flavones and reducing sugars. Each extract was analysed. The aerial parts extract in ethanol showed four spots on TLC. The compound with Rf 0.16 on isolation showed deep purple colour under UV light, its identification was confirmed by its chemical and spectral analysis. The compound was luteolin glycoside. The other compound, Rf 0.08 was identified as B.sitosterol. The sugar portion of these glycosides was found to be glucose and

galactose, which were confirmed by comparison with the authentic specimens. The roots extract of the plant showed the presence of B.sitosterol and veratic acid. The alcoholic extracts of the leaves showed the presence of glycosides which were tested for saccharides moiety of the aglycones. The sugars identified were glucose, galactose and glucuronic acid.

Lipids (32.8%) from the finely ground seeds of *Cardiospermum halicacabum* were extracted and purified. The seed lipids of this species are unique in having a very high percent of unsaturated fatty acids particularly C20:1 acid as one of the chief component acid in its glycerides. The lipid fractions of *Cardiospermum halicacabum* L. include also arachidic, linoleic, oleic, stearic and other lower fatty acids. The fatty acid composition of lipid fractions of this species was carried out first time. [2]

This plant is an annual or perennial climber found in tropical and subtropical Asia and Africa. While the whole plant has been used for centuries to treat rheumatism, stiffness of limbs and snake bite, the root alone has been used for curing diseases related to the nervous system. The root is mucilaginous, emetic, laxative and anti-rheumatic and it is used traditionally for treatment of anxiety and epilepsy.

Based on experiments conducted, the alcoholic root extract of *Cardiospermum halicacabum* shows anticonvulsant activity. It acts by inhibiting low threshold T-type Ca^{2+} currents or by increasing GABAA receptor mediated inhibition. Plus, as it prevents the spread of seizure by inhibiting the tonic seizure activity in well-established animal seizure models it can be effective to treat grandmal and partial seizures in human.

Besides, extracts of *Hypoxis hemerocallidea* (Hypoxidaceae) corm ('African potato') are used in South African traditional medicines in treating childhood convulsions and epilepsy. [3] This study examined the anticonvulsant activity of the plant's corm aqueous extract (APE, 50–800 mg/kg i.p.) against pentylenetetrazole, picrotoxin and bicuculline induced seizures in mice. Phenobarbitone and diazepam were used as reference anticonvulsant drugs for comparison. Like the reference antiseizure drugs used, *Hypoxis hemerocallidea* corm aqueous extract (APE, 100–800 mg/kg i.p.) significantly delayed the onset of, and antagonized, pentylenetetrazole (PTZ)-induced seizures. The plant's corm

aqueous extract also profoundly antagonized picrotoxin (PCT)-induced seizures, but only weakly antagonized bicuculline (BCL)-induced seizures.

Based on experiments conducted on mammalian models, the plant's corm aqueous extract exhibit antiseizure effect by enhancing GABAergic neurotransmission and/or action in the brain. Thus, it can be used to control or treat convulsion or epilepsy. The findings of this study indicate that Hypoxis hemerocallidea corm aqueous extract possesses anticonvulsant activity, and thus lend pharmacological credence to the suggested folkloric, anecdotal ethnomedical uses of the herb in the management of childhood convulsions and epilepsy in some rural communities. [4]

Another example is *Ocimum gratissimum* L. (Lamiaceae) which is a small shrub commonly known as "scent leaf," "tea bush" or "fever plant. [5] In a study, the extracts of the leaves exhibited anticonvulsant activity by delaying the onset of PTZ-induced seizures and protecting treated mice from death induced by seizures. The anticonvulsant activity of ME, PE and MF was evaluated using the pentylenetetrazol-induced seizure in mice. Adult male albino mice (22-30 g) were randomly divided into eight groups. [6] Animals in groups I-VI received oral administration of ME, PE and MF (200 and 400 mg/kg), respectively, while groups VII and VIII received diazepam (1 mg/kg p.o.) and 10% Tween 80 (10 mL/kg p.o.), respectively. Thirty minutes later, pentylenetetrazol (PTZ) (70 mg/kg i.p.) was administered to each animal. The animals were observed for 60 minutes for seizures; an episode of clonic spasm that persisted for a minimum of 30 seconds was taken as a threshold convulsion. [7] Animals devoid of threshold convulsion and without subsequent death during the 60 minutes of observation were considered protected. Drugs protecting against tonic-clonic seizures induced by PTZ can be important in controlling myoclonic and absence seizures in humans. Findings from this study also showed that leaves of *O. gratissimum* has substances that possess anticonvulsant and anxiolytic-like activities. Thus, it can be effective to treat seizures. [8]

Another important medicinal plant is the *Dendrophthoe falcata* (Linn. f.) known as 'Vanda' in the Indian Ayurvedic System of Medicine. It is a large bushy usually glabrous branch-parasite. [9] The whole plant is widely used to treat various ailments. Traditionally it is used for epilepsy. Preliminary phytochemical analysis revealed presence of proteins, carbohydrates, glycosides, steroids, triterpenes, flavonoids, tannins and phenolic compounds. *D. falcata* ethanolic extract (DFEE) significantly inhibited seizures induced by MES, reduced the duration of hind limb tonic extensor phase (HLTE) and a decline in motor coordination. It seems that the antiseizure and muscle relaxant activity maybe related to flavonoids and triterpenes present in extract. [10]

Besides, study conducted on other herbal plants such as herbal extracts of *Swertia chirata* and *Cinnamomum zeylanicum* for anticonvulsant activity have shown positive results on the anticonvulsant activity [11]. Adult male rats were given extracts of *Swertia Chirata* and *Cinnamomum zeylanicum* alone at three doses of 250, 500, 750 mg/kg,

(p.o.) and combination of both extracts. Standard drug phenytoin sodium at 25 mg/kg, (i.p.). MES and PTZ model are used to test the anticonvulsant property of extract. In MES model duration of extensor phase and in PTZ model onset of action was observed and evaluated. The duration of hind limb extension in MES test was reduced by 75 % significantly by *Swertia Chirata* and *Cinnamomum zeylanicum* at a dose level of 500mg/kg. In PTZ group, the seizure latency was prolonged by *Swertia Chirata* and *Cinnamomum zeylanicum* at dose levels of 250, 500mg/kg and 500, 750mg/kg respectively. The lower dose was found to be effective in case of *Swertia chirata* by 70% whereas the higher dose did show 72% effectiveness. In case of *Cinnamomum zeylanicum* the lower dose showed 53% effectiveness while the higher dose showed was 85% in force. This investigation has demonstrated that *Swertia chirata* and *Cinnamomum zeylanicum* possess anticonvulsant activity. [12]

Most of the studies conducted have not clearly proven the mechanism of the anticonvulsant activity exhibited in the herbal extracts. Therefore, it still needs further investigation to elucidate the other active compounds and the underlying mechanism. Plus, there are a vast amount of therapeutic herbal plants yet to be discovered.

References

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