Comparative Analysis of the Anticonvulsant activity of Crinum jagus and Solanum indicum in Mice

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Abstract

There is no known drug that has prevented or cured reoccurrence of epileptic seizures, hence the need to explore and compare natural remedies that are employed in folkloric treatment of convulsion. The aim of the present was to assess comparatively, the anticonvulsant activity of methanol extracts of Crinum jagus and Solanum indicum. The crude methanol extracts of the bulbs and fruits of C. jagus and S. indicum, respectively, obtained by 72 h maceration in methanol. The extracts were evaluated for anticonvulsant activity using mice and electroconvulsive shock equipment (Ugobasile ECT UNIT 7801). Four groups of six animals each were used for each extract. Group I received no extract serving as control in both cases. Groups II, III and IV received varying concentrations (32.50, 25.50; 41.50, 51.50; and 64.50, 112.50 mg/kg) for C. jagus and S. indicum respectively. All medicaments were protective against electrically induced convulsion. C. jagus showed protection after administration of 64.50 mg/kg body weight while S. indicum was at 112.50 mg/kg body weight. The two extracts justified their use in traditional and folkloric setting with the bulb extract of C. jagus possessing greater anticonvulsant effect than the fruit extract of S. indicum.

Keywords:
Crinum jagus, Solanum indicum, Anticonvulsant activity, Comparative analysis

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1 Introduction

Epilepsy is a chronic disorder characterized by recurrent seizures. Seizures are finite episodes of brain dysfunction resulting from abnormal discharge of cerebral neurons¹. With the highest incident occurring in early childhood, the etiology of seizures are many and include the complete range of neurologic diseases, from infection to neoplasm as well as head injury, with heredity in a few subgroups, proving to be a major contributing factor². Depending on the distribution of discharges, the abnormal central nervous system activity could present various manifestations, ranging from dramatic convulsive activity to phenomena not easily discernable³. Anticonvulsants are a group of drugs known to depress abnormal nerve activity in the brain, thereby blocking seizure. More than one third of patients with epilepsy experience inadequate control of seizures with drug therapy⁴ and there is no known drug that has eliminated or prevented reoccurrence of epileptic seizures⁴. Recognizing that epilepsy is the second most common neurologic disorder after stroke¹, there is a pressing need for agents that are truly antiepileptogenic to either prevent or alter the course of epilepsy⁴. C. jagus is called Uledein Igbo, South eastern Nigeria. Other names of C. jagus which belongs to the family Lilaceae, include: St. Christopher’s Lily, Scillifolia, Vanillodorum, Noble, and rattrayi⁶. It is used in the treatment of sores and chronic cough respectively⁶. Phytochemical analysis shown the isolation of Lycorine and hamayne, tetrahydrate 1, 4 oxazine (morpholine) as hydrochlorides and calcium oxalate and calcium tartarate as calcium salts from C. jagus⁷.
S. indicum also called Solanum ferrox is an erect armed shrub coarsely tomentose with stiff yellow spines. It is commonly found in wet places in villages and sometimes planted near houses. S. indicum berries are used as laxative and sometimes applied to sores in the ears. Age-long use of medicinal plants especially in developing countries seem to have different formulations. For C. jagus, the bulb is used either singly or concomitantly blended with Xylopiaethiopicum or/and Chromoleanaadoreta, then rubbed into incisions made on the body in the treatment of all forms of convulsive fits. The fruits of S. indicum are ground, cooked in water and taken orally; also they are ground and rubbed into incisions around the neck region. Leaves of S. indicum are squeezed and introduced into the eyes of convulsing infant; the leaves and fruits of Xylopiaethiopicum are ground together, mixed with palm oil and rubbed on the body of the convulsing infant. As a preventive measure, the expectant mothers superstitionally, rub the above mixture around their waist against epilepsy in children when delivered. The versatility of the use of C. jagus as well as S. indicum folklore management of convulsion informed the choice for this study of ascertaining their efficacy as well as compares their potency.

2 Materials and Method

2.1 Plant materials

Bulbs of C. jagus and fresh fruits of S. indicum were obtained from Owerri, Imo State, Nigeria. The samples were authenticated at the Department of Pharmacognosy, Madonna University, Elele, Nigeria, where voucher specimen (number MIPC. 180/13) was deposited in the Department’s herbarium. The samples, bulbs of C. jagus and fresh fruits of S. indicum were weighed, separately cleaned in distilled water and blended with 80% aqueous methanol. All extracts were filtered using Whatman’s No. 1 filter paper and the solvent was removed under reduced pressure. Solutions of 0.008 g/mL and 0.270 g/mL were made with distilled water.

2.2 Animals

Albino mice (20-32 g) kept in the Laboratory Animals facility of Department of Pharmacology and Toxicology, Madonna University, Elele, Nigeria, were used in this study. The animals were maintained under standard laboratory conditions and had unrestricted access to standard pellets (Vital Feeds Plc, Nigeria) and clean water. The animals, prior to experimental use, were transferred to work area and allowed two weeks of acclimatization. All animals in this study, were handled according to international guidelines and ethics.

2.3 Experimental design

The albino mice were weighed and kept in four groups of 6 animals each. Varying concentrations (Tables I and II) of the plant extract solution were administered intraperitoneally, to each group once, based on average body weight. Animals in the control group received distilled water. An electroconvulsant shock equipment (Ugobasile ECT UNIT 7801) was used. A current of 50 mA was delivered for 0.2 second duration, through the ear-lobes. The mice were tested every ten minutes from the time of drug administration. Introduced current produce tonic forelimb and hind-limb extension in the mice. Protection from the tonic limb extension in mice indicates no convulsion.

2.4 Statistical analysis

The generated data were expressed as mean± standard error of mean (SEM). Statistical comparisons were performed by one-way ANOVA, followed by Tukey-Kramer multiple comparisons test and Student-Newman-Keuls multiple comparisons test and the values were considered statistically significant when p value is less than 0.05 (p<0.05).

3 Results

Maximal electroshock produced hind limb tonic extension in all the animals. The response of the electroshock-induced convulsive mice to C. jagus bulbs extract and S. indicum fruits extract are shown in tables 1 and 2, respectively. All of the two extracts showed some protection against electroshock induced convulsion. C. jagus showed protection after administration of 64.50 mg/kg body weight while S. indicum was at 112.50 mg/kg body weight. However, the two extracts showed protection that lasted not more than 40 minutes after administration. The normal group (control) for both received no extracts and showed no protection against electroshock induced convulsion.

4 Discussions

Epilepsy is a group of chronic neurological disorders characterized by sporadic episodes of convulsive seizures, sensory disturbance, abnormal behavior and loss of consciousness or all of these symptoms resulting from a brain dysfunction or an abnormal discharge of cerebral neurons. Medicinal plants have served as sources of readily accessible, inexpensive, and effective medication since the earliest times known to man. Several ethnomedicinal plants have been found to possess neurobehavioral profile and serve as alternative to modern medicine. Biological evaluation and scientific validation of the ethnomedicinal plants are the need of the hour. The present study was proposed to evaluate anticonvulsant effects of methanol extract of C. jagus bulbs and S. indicum fruits.

The results indicated that the methanol extracts of C. jagus bulbs and S. indicum fruits showed anticonvulsant activity. The anti-convulsant activity of the two extracts may be attributed to the potentiation of neurotransmitter within the brain.

The anticonvulsant effect of both extracts however, was of short duration, less than an hour. Despite this, when administered on human, the duration could be short-lived or may have a more prolonged effect as prevalent with phenobarbitone which has
duration of 1 – 2 hours in mouse model and a long duration of action in human. The continuous administration may have a cumulative curative tendency that is long lasting. The concentration level noted to be effective – 64.50 mg/kg and 112.50 mg/kg for C. jagus and S. indicum, respectively, are lower than that reported for Vitexnegundo extract (250 mg/kg body weight) used in India as an anticonvulsant.

Table 1: Comparative response of the electroshock-induced-convulsive mice treated with C. jagus bulb extract

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<thead>
<tr>
<th>Dose (mg/kg)</th>
<th>Response time (mins)</th>
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<tbody>
<tr>
<td>Body weight</td>
<td>10</td>
</tr>
<tr>
<td>0.00</td>
<td>+ +</td>
</tr>
<tr>
<td>32.50</td>
<td>+ +</td>
</tr>
<tr>
<td>41.50</td>
<td>+ +</td>
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<tr>
<td>64.50</td>
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Where --- means protected with no convulsion, +: slight convulsion with quick recovery (partial protection), ++: No protection, aggravated convulsion and death

Table 2: Comparative response of the electroshock-induced-convulsive mice treated with S. indicum fruits extract

<table>
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<tr>
<th>Dose (mg/kg)</th>
<th>Response time (mins)</th>
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<tbody>
<tr>
<td>Body weight</td>
<td>10</td>
</tr>
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<td>0.00</td>
<td>+ +</td>
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<tr>
<td>25.50</td>
<td>+ +</td>
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<td>51.50</td>
<td>+ +</td>
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<td>112.50</td>
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In electroconvulsive shock induced convulsion model, electroconvulsive shock induces seizure particularly due to the spread of stimulus throughout the body and anticonvulsant drugs that block the effect of electroconvulsive shock act by blocking the seizure spread. Thus, the present study indicates that the extract of C. jagus and S. indicum ability to slow down the spread of seizure.

5 Conclusion
The bulb extract of C. jagus and fruits extract of S. indicum were protective against electrically induced convolution with the former exerting greater anticonvulsant effect. In conclusion, bulb extract of C. jagus and fruits extract of S. indicum were possesses anticonvulsant effects and these findings collaborate with the ethnomedicinal uses of these plant.

6 Conflict of interest
The authors have not declared any conflict of interest.

7 Source of support
Nil

8 Author’s contributions
OSC and MHU carried out literature review and participated in collection of data, read and approved the final manuscript.

9 References


