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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.*

1 Introduction

Epilepsy is a chronic disorder characterized by recurrent seizures. Seizures are finite episodes of brain dysfunction resulting from abnormal discharge of cerebral neurons[1]. 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 factor[2]. 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 discernable[2.]. 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 therapy[3] and there is no known drug that has eliminated or prevented reoccurrence of epileptic seizures[4]. Recognizing that epilepsy is the second most common neurologic disorder after stroke[1], there is a pressing need for agents that are truly antiepileptogenic to either prevent or alter the course of epilepsy[5]. *C. jagus* is called Uledein Igbo, South eastern Nigeria. Other names of *C. jagus*which belongs to the family Liliaceae, include: St. Christopher's Lily, Scillifolia, Vanillodorum, Noble, and rattrayii[6]. It is used in the management of memory loss and other mental symptoms associated with aging and the bulb extract showed inhibition of acetyl cholinesterase[7].The leaves and bulbs reported in the treatment of sores and chronic cough respectively[8]. 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. jagus*[6].

S.indicum also called *Solanumferox* 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[9]. *S. indicum*berries are used as laxative and sometimes applied to sores in the ears[10]. Age-long use of medicinal plants especially in developing countries seem to have different formulations[11]. For *C. jagus*, the bulb is used either singly or concomitantly blended with *Xylopiaethiopicum* or/and chromoleanaodorata, then rubbed into incisions made on the body in the treatment of all forms of convulsive fit[12,13]. 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[12]. Leaves of *S. indicum* are squezzed 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 superstitiously, rub the above mixture around their waist against epilepsy in children when delivered[12]. The versatility of the use of *C. jagus* as well as *S. indicum*in the folkloric 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 M/PC. 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 ofacclimatization. All animals in this study, were handled according to international guidelines and ethics[14].

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 electroconvulsive 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 table 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[15,16]. 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[17, 18]. 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[19]. 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[20].

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

Dose (mg/kg) Body weight	Response time (mins)				
	10	20	30	40	50
0.00	+ +	+ +	+ +	+ +	+ +
32.50	+ +	+ +	+ +	+ +	+ +
41.50	+ +	+ +	+ +	+ +	+ +
64.50	----	----	+	+	+ +

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

Dose (mg/kg) Body weight	Response time (mins)				
	10	20	30	40	50
0.00	+ +	+ +	+ +	+ +	+ +
25.50	+ +	+ +	+ +	+ +	+ +
51.50	+ +	+	+	+	+ +
112.50	+ +	----	----	+	+ +

Where --- means protected with no convulsion, +: slight convulsion with quick recovery (partial protection), ++: No protection, aggravated convulsion and death

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 convulsion 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.

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