

Histological Study of the Effect of Ethanolic Leaf Extract of *Sida Acuta* on the Cerebral Cortex of Adult Wistar Rats

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Abstract: *The pantropical shrub, Sida acuta is a medicinal plant used in the treatment of a variety of ailments. This study was to investigate the effect of ethanolic leaf extract of Sida acuta on the histological feature of the cerebral cortex. Twenty female rats weighing between 150-200g were used for this study. The rats were divided into four groups labeled A, B, C, and D with each group consisting of five rats. Group A served as the control and received distilled water, while groups B, C and D, the experimental groups, received 200mg/kg, 400mg/kg and 600mg/kg of ethanolic leaf extract of Sida acuta respectively for 14 days. The extract was orally administered with the aid of an orogastric tube. Twenty four hours after the last administration, the animals were sacrificed by chloroform inhalation method; the cerebral cortex dissected out and fixed in 10% formal saline for routine histology and thereafter stained using Haematoxylin and Eosin method. Histological observations of the cerebral cortex showed 4 basic zones namely marginal, cortical, intermediate and sub-ventricular, while animals administered with 200mg/kg, and 600mg/kg, showed hyperplasia of cells in the cortical, intermediate and sub-ventricular layers, respectively. Animals that received 400mg/kg of the extract showed hypertrophy of cell in the intermediate and sub- ventricular layers. This result suggests that high doses of ethanolic leaf extract of Sida acuta may cause some neurological disorders; therefore caution must be taken when used for the treatment of various ailments.*

Key word: *Cerebral cortex, Hyperplasia, Hypertrophy, Neurological, Sida acuta, Subventricular.*

I. Introduction

Traditional medical knowledge based on the use of natural products from plants has often been the basis for discovering new drugs. It is estimated that 80% of many developing countries population still use plant-based traditional medicines (1). These natural products and their derivatives represent almost half of the drugs approved since 1994 (2). *Sida acuta* is a tropical weed of pastures, road sides and waste areas. Research carried out by Sofowara (3) revealed that juice from leaf of *Sida acuta* is antihelminthic for intestinal worms, the root inhibit embryo implantation or growth in the mice (4). Some herbalists have claimed the traditional use of this plant to cure infections such as malaria, ulcer, fever, gonorrhoea, abortion, breast cancer following inflammation, wound infections. Some of these claims have also been experimentally proven (5-6). The leaf is most frequently used against various infections. Phytochemical evaluation of *Sida acuta* leaf revealed the presence of alkaloids, saponins, flavonoids, anthraquinones, cardenolides, polyphenols and tannins (7). The plant contains chemical constituents such as cryptolepine 5-methylindole (2-3b)-quindoline, ecdysterone, ephedrine, hentriconane and hypolaetin-8-glucoside (8-9). Kuniata and Rapp (10) have also reported that leaf of *Sida acuta* is not liked by cattle due to the presence of different chemicals including alkaloids.

Sida acuta is mainly known for its healing effects and used as healing agents, and is being used as an herbal medicine for the treatment of malaria, ulcer, gonorrhoea, wound infection, asthma, headache, cold, fever, cough, skin disease and facial paralysis (11). *Sida acuta* has also been reported to have contraceptive property (12), hepatoprotective (13), antibacterial (14) and antimicrobial activity (15). The cerebral cortex plays a key role in memory, attention, perceptual awareness, thought, language and consciousness (16). Due to the importance of the cerebral cortex, this research was carried out to investigate likely effect of the ethanolic extract of *Sida acuta* leaf on the cerebral cortex of adult wistar rats.

II Material and methods

Twenty (20) female rats were used for this study. They were obtained from the Department of Pharmacology, University of Calabar, Cross River State, Nigeria and weighed between 120g-150g. The rats were housed in well ventilated cages and kept in the animal house in the Department of Human Anatomy, University of Calabar. Permission was sought for the study from the departmental Ethical Committee and the study was carried out according to the principles prescribed for laboratory animal use. They were fed with normal rat chow and water was provided ad libitum throughout the duration of the experiment.

2.1 Preparation of the extract

Fresh leaves of *Sida acuta* weed were obtained locally from the Calabar botanical garden, Mary Slessor Road, Calabar, Cross River state, Nigeria. They were then washed under the running tap water to remove the impurities after which they were left to dry at normal room temperature for seven days. The dried leaves were then grinded to powder using electric blender. The extraction method involved cold ethanolic extraction, where a known weight of the blended sample was soaked in ethanol for 24 hours and then the extract was filtered and evaporated to dryness at room temperature to obtain the crude extract.

2.2 Experimental protocol

The rats in Group A serve as the control group and received distilled water while the rats in Groups B, C and D the experimental animals received 200mg/kg, 400mg/kg, 600mg/kg body weight of ethanolic leaf extract of *Sida acuta* respectively for 14 days using orogastric tube. Twenty four hours after the last administration, the rats were sacrificed using the chloroform inhalation method. The cerebral cortex was extracted and immediately fixed in formal-saline for histological studies.

III Results

Histological study of the cerebral cortex using H&E staining method in the control group A, showed four basic histological layers. These zones from outward - inwards are Marginal (M), cortical (C), Intermediate (I) and sub-ventricular (SV) (Fig1). Hypoplasia of cells in the cortical, Intermediate and sub-ventricular zones was intense in group that received 200mg/kg of leaf extract (Fig 2).

Hypertrophy of cells was seen in the groups that received 400mg/kg and 600mg/kg of the leaf extract especially in the sub-ventricular and ventricular zones when compared with the control and treated groups that received 200mg/kg and 600mg/kg of the leaf extract (Fig 3, Fig 4).

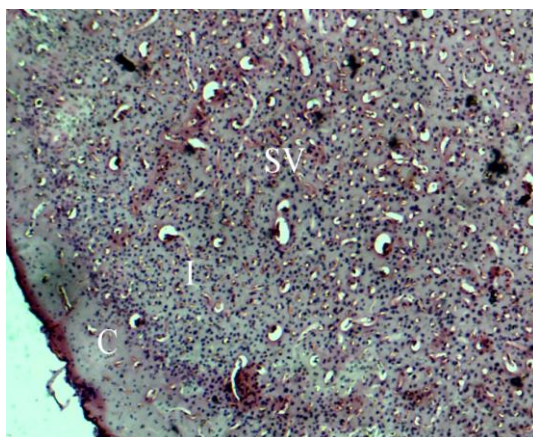


Fig 1: Cerebral cortex of control animals showing 4 basic zones, Marginal (M), cortical (C), Intermediate (I) and sub-ventricular (SV)

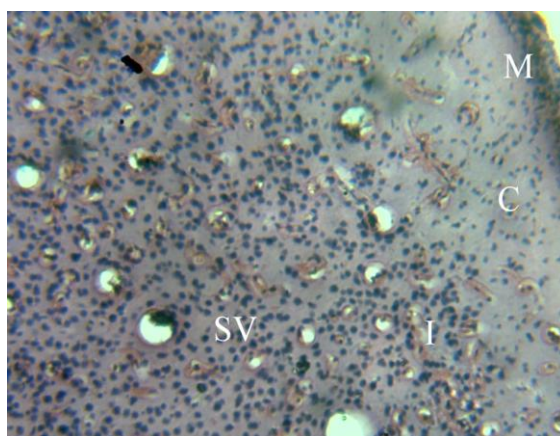


Fig 2: Cerebral cortex of 200mg/kg showing slight hypoplasia of cells in the cortical, Intermediate and sub-ventricular layers (H & E X 400) (H & E X 400)

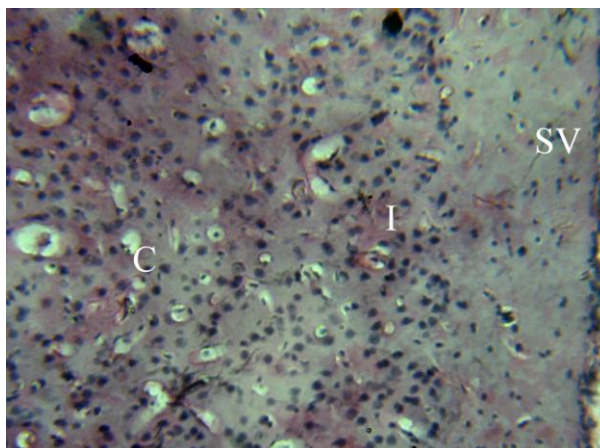


Fig 3: Cerebral cortex of 400mg/kg showing hypertrophy of cells

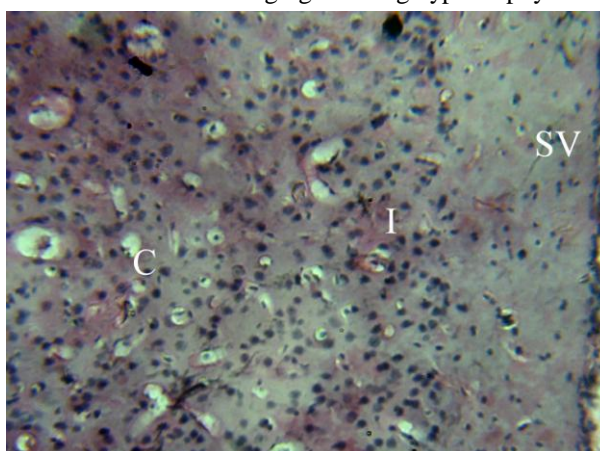


Fig 4: Cerebral cortex of 600mg/kg showing intense hypoplasia and in the cortical, Intermediate and sub-ventricular layers (H & E X 400) slight hypertrophy of cells in the cortical, Intermediate and sub-ventricular layer (H & E X 400).

IV. Discussion

Medicinal plants have been used as healing agents in many parts of the world especially Africa, where access to formal health care is limited. The use of herbs provides an indication of beliefs about illnesses and their treatment and may conflict with beliefs of workers in the formal health system (17). The cerebral cortex is a sheet of neural tissue that is outer-most to the cerebrum of the mammalian brain. It plays a key role in memory, attention, perceptual awareness, thought, language and consciousness (18). In this study, the control group A of the cerebral cortex showed 4 basic histological layers, the 200mg/kg dosage showed slight hypoplasia of cells in the cortical, intermediate and sub-ventricular layers, the 400mg/kg dosage showed hypertrophy of cells in the cortical, intermediate and sub-ventricular layer and the 600mg/kg dosage showed intense, hypoplasia of cells in the cortical, intermediate and sub-ventricular layers when compared with the control group and the group that received 200mg/kg of the extract.

These changes may be due to the effect of some alkaloids in the ethanol leaf of *Sida acuta*; and the GC-MS analysis of this alkaloids extracts of *Sida acuta* led to the isolation of 2 major constituents such as cryptolepine and quindoline (8). These indolizidine alkaloid has been identified as the toxic constituent of *Sida* species responsible for the neurological disorders mainly in animals (19). Although the two major alkaloids in the extract-cryptolepine and quindoline, exhibit good antimicrobial activity against several test microorganisms (8). However, *Sida acuta* only showed significant protection of 55% at the highest dose out of a 100% and as such it is unsafe to take this extract orally because it contains ephedrine which can cause serious side effects including hypertension, myocardial infarction, seizure, stroke and psychosis; cells of the cerebral cortex are related to the integration of sensory information and initiation of voluntary motor responses (20).

In conclusion, *Sida acuta* ethanolic leaf extract may affect the functions of the cerebral cortex indicated by hypoplasia and hypertrophy of cells in the cortical, intermediate and sub-ventricular layers.

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