THE PROTECTIVE ROLE OF AQUEOUS EXTRACT OF *FICUS VOGELII (FV)* ON THE LOWER REPRODUCTIVE ORGANS (VAGINA AND CERVIX) OF LEAD ACETATE INDUCED TOXICITY OF AN ADULT FEMALE WISTAR RATS

UCHEWA, OBINNA ONWE[1]; OKORONKWO, CHRISTIANA AKUDO[2]; IGWE, EMEKA CHIKA[3]; EGWU, AMAOBI JUDE[4] AND OKORONKWO, SAMUEL OKAFOR

[1,4]Department of Anatomy, Faculty of Basic Medical Sciences, Federal University Ndufu-Alike, Ikwo (FUNAI), Ebonyi State, Nigeria
[2,3,5]Department of Anatomy, Faculty of Basic Medical Sciences, Ebonyi State University (EBSU), Abakaliki, Ebonyi State
Corresponding Author: UCHEWA, OBINNA ONWE.
Department of Anatomy, Federal University Ndufu-Alike, Ikwo (FUNAI), Ebonyi State, Nigeria
+2348172628746 E-mail address: euchewa1@gmail.com

ABSTRACT

Lead, as one of the most harmful environmental toxicants, affects both the physiology and histology of the vagina and cervix. This reduces their functionality; therefore, the check on the protective role of *Ficus vogelii Fv* leaves aqueous extract in lead toxicity. The experiment lasted for a period of 35days involving 20 adult female Wistar rats with an average weight of 200grams. The rats were divided into five (5) groups A, B, C, D and E. A and B are negative and positive control groups which received water *ad libitum* and lead acetate solution respectively, C received aqueous extract of *Fv* (100g/kg) first 14days and thereafter induced with lead acetate solution 14days, D received aqueous extract of *Fv* (300g/kg) for 14day and then 24 hours later treated with lead acetate solution for another 14days while E received aqueous extract of *Fv* for 14days. Histological studies of the vagina and cervix showed a remarkable damage such as necrosis, oedema, size reduction and denudation of the vaginal walls in group B while group

A looked healthier and well vascularized. The animals that received the extract were protected from the damages caused by the administration of lead acetate. The exposure to lead acetate produced significant histological alterations caused by lead accumulation that lead to reduction in blood supply to the vagina and cervix which caused the mucosa to necrotize. These alterations can make the vagina and cervix acidic which have been implicated as one of the cause of infertility in females. The result of this research indicates that *F. vogelii* protects reproductive organs (vagina and cervix) from environmental toxicant (lead) damages.

Keywords: *Ficus vogelii,* necrosis, protective, reproductive and Vagina

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INTRODUCTION

Lead is a very deadly environmental toxicant to various part of human body which can adversely affect the reproductive system leading to reproduction impairment. It has been reported that the female reproductive system's physiology in vitro can be modified by exposure to a very low level of lead[5]. Longer and more variable menstrual cycles have been found in lead treated female Rhesus monkeys[11]. The vagina as an important organ of female reproductive system is also referred to as

birth canal where the foetus passes during birth. Its importance in reproduction cannot be over emphasized. The Semen is deposited in the vaginal vault during intercourse. Spermatozoa make their way into the external os of the cervical canal, pass through the cervical canal into the uterine cavity, and then continue through the uterine cavity into the uterine tubes where fertilization normally occurs in the ampulla[3]. This informed the need to examine the effect of lead toxicity in the vagina of Wistar rats as model for humans. The cervix is a narrow and cylindrical part of the uterus which communicates with the uterine body via the internal os and opens into the vagina at the external os[3,20,24]. During the movement of the spermatozoa, it moves from the vagina into the cervix and so anything that affects the histology of the cervix is likely to alter the structure of the cervical mucus which protects the sperm from naturally acidic environment of the vagina and gets it safely to the ovum[21]. The extent of natural fertility that takes place is invariably connected to the motility of the spermatozoa and one of the things that affect sperm motility is vaginal toxicity (acidity). The toxicity of the vagina which can affect its histology causes the death of the spermatozoa and thereby impedes fertility[25].

This study was carried out to assess the role aqueous extract *F. vogelii* can play in protecting the vagina and cervix against the histological damages caused by lead acetate induced on the female Wistar rats.

MATERIALS AND METHODS

Collection and Authentication of Plant materials

Fresh leaves of *F. vogelii* was collected from Enyibichiri Ndufu-Alike a town in Ikwo Local Government Area of Ebonyi State where Federal University Ndufu-

Alike Ikwo (FUNAI). Authentication of the plant leaves was done in Botany Department of the University of Nigeria Nsukka (UNN).

Preparation of the extracts

The leaves were dried in a ventilated room. Thereafter, it was crushed into powder using pestle and mortar, and passed through mesh sieve to get the fine powders. The powder form was then divided into two equal portions (A and B). Portion 'A' was used for the phytochemical analysis and 'B' portion was used for the aqueous extraction[16]. The powdered form of B was soaked in water for 48 hours and filtered using a white muslin cloth to remove debris and then re-filtered with filter paper to obtain a homogenous clear filtrate. The filtrate was concentrated *in vacuo*, using a rotary evaporator at <40^{o}C to yield a sticky paste. This was stored under refrigeration at <4^{o}C until required. All preparations were performed at the Department of Anatomy, Faculty of Basic Medical Sciences, Federal University Ndufu-Alike Ikwo (FUNAI), Ebonyi State, Nigeria.

Animal Procurement and Housing

A total of twenty (20) adult female Wistar rats with an average weight of 200g was procured from the animal house of the Department of Pharmacology, University of Nigeria Enugu Campus (UNEC) and maintained in the Animal House of Anatomy Department of Faculty of Basic Medical Sciences of the same University. The animals were housed in netted cages, fed with grower's mash and allowed water *ad libitum* with acclimatization period of seven (7) days.

Experimental Design

The negative control group (A) received standard rat's diet and tap water *ad libitum*[10]. The rats in positive control group (B) received 1.5mg/kg of Lead acetate solution daily[2]. Group C received aqueous extract of *F. vogelii* (100g/kg) for 14days and 24 hours later exposed to lead acetate (1.5mg/kg) till the end of experiment (14days). Group D received aqueous extract of *F. vogelii* (300g/kg) for

14days and 24 hours later exposed to lead acetate (1.5mg/kg) till the end of experiment (14days). While Group E received 300mg/kg of aqueous extract of *F.vogelii* daily only.

Histological Study

At the end of the experiment, the rats were starved overnight and anaesthetized with chloroform and then decapitated[17]. The animals were dissected and the vagina removed and quickly fixed in bouin's fluid for routine histological procedures. The tissue was processed and embedded in paraffin wax. Thick sections (5-6μm) were obtained and stained using haematoxylin and eosin (H&E) and were examined under light microscope to determine the histological changes that occurred.

RESULTS

The results of the phytochemical screening and histological studies as carried out in the research involving the adult female Wistar rats at the end of 35 days are presented in the figures below as histological slides.

Phytochemical analysis

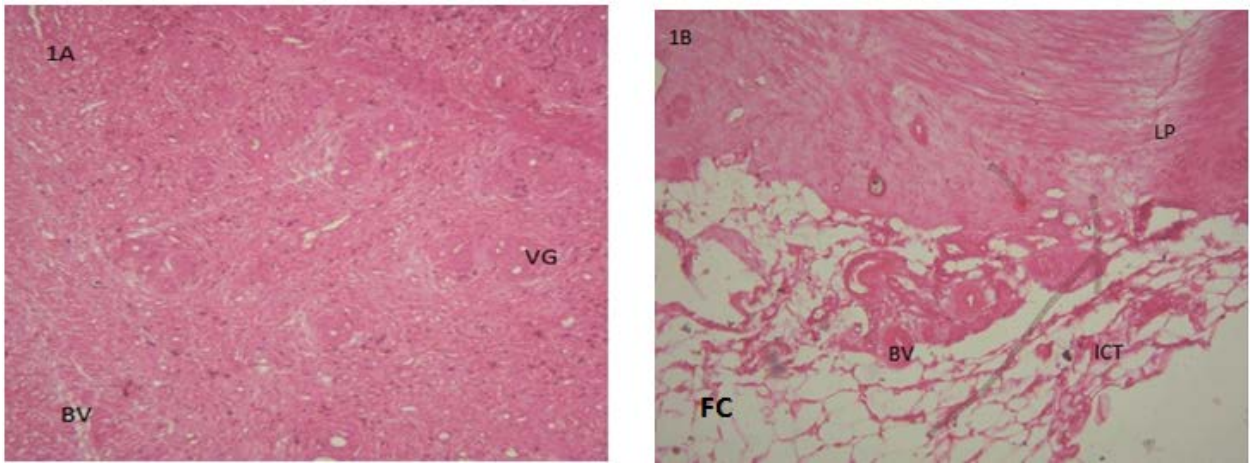
Using standard methods as recorded in[14], the following chemicals were screened for in *F. vogelii* -Tannins, saponins, triterpenoids, lectins, starches, anthocyanins, tannins and reducing sugar. The results of the phytochemical screening are presented in table 8 as shown below.

Table 8.0: Phytochemical compositions of aqueous and ethanolic extracts of dried leave of F. *vogelii*

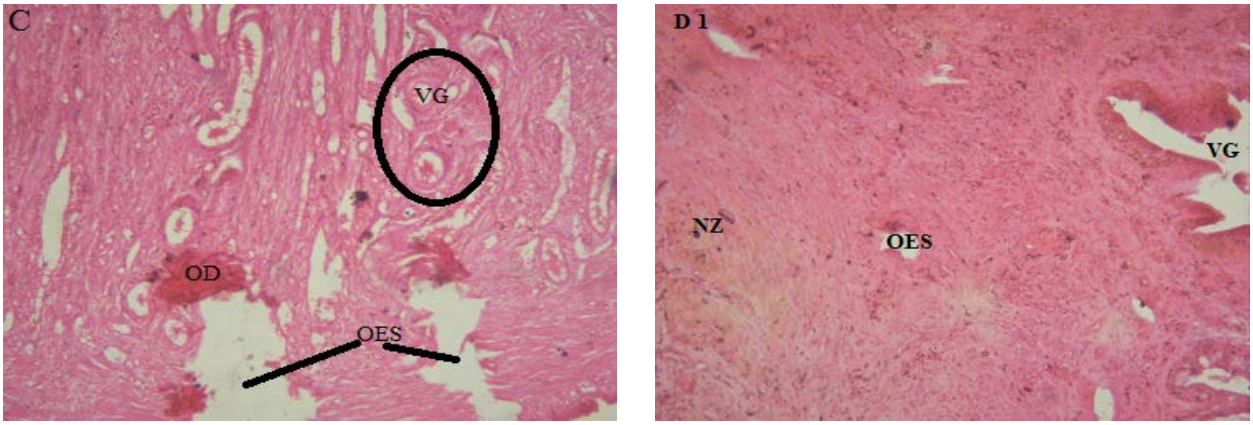
S/No	Parameter	Present	Absent	Moderate	High
1	Saponins				***
2	Starch	*	-		
3	Triterpenoids	*			
4	Tannins			**	
5	Anthocyanins	*			
6	Lectins			**	
7	Reducing sugar		-		

The vagina

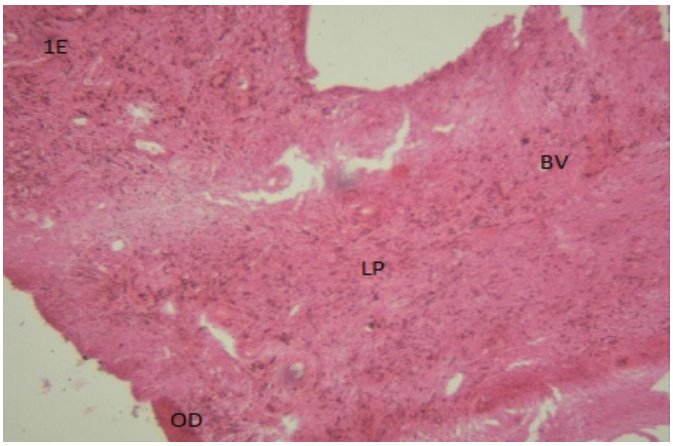
When the vagina was microscopically examined, it revealed the presence of a normal structure of vaginal mucosa and glands with no distortions as shown in figure 1A. Figure 1E represents the group that received only the extract with normal histological features. After exposing the rats to 1.5mg/kg lead acetate (positive control), the vagina showed some areas with optically empty spaces in the tissue, as well as diffused oedema, vaginal wall denudation, necrotic zones, and vaginal glands necrosis as presented in figure 1B below. The administration of the extract to the animals before the lead acetate actually reduced the level of damages done to the vagina. This is presented in Figures C1 and D1 below. This suggests that the level of toxicity may have been reduced by the extract of *F. vogelii* leaves.



Figures 1A: Vagina from group A (negative control) revealed the presence of a normal mucosa, BV-Blood vessel and VG-Vagina gland. (1B) Vagina following administration of lead acetate (1.5mg/kg). BV-Blood vessel, FC-Fatty change, ICT-Interconnective tissue and LP-Lamina propria. H & E stains, 200X.



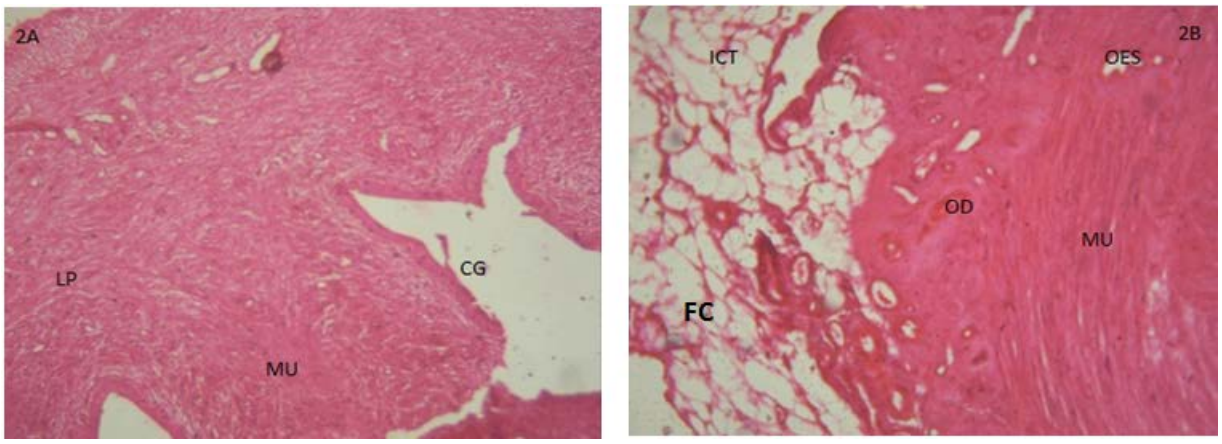
Figures (1C) Vagina following administration of aqueous extract of *F. vogelii* (100g/kg) for 14 days and 24 hours later exposed to lead acetate (1.5mg/kg) for another 14 days. OD-Oedema, LP-Lamina propria, OES-Optically empty space and NZ-Necrotic zone. (1D) Vagina following administration of aqueous extract of *F. vogelii* (300g/kg) for 14 days and 24 hours later exposed to lead acetate (1.5mg/kg) for another 14 days. OES-Optically empty space, MU-Muscle, NZ-Necrotic zone and LP-Lamina propria. H & E stains, 200X.



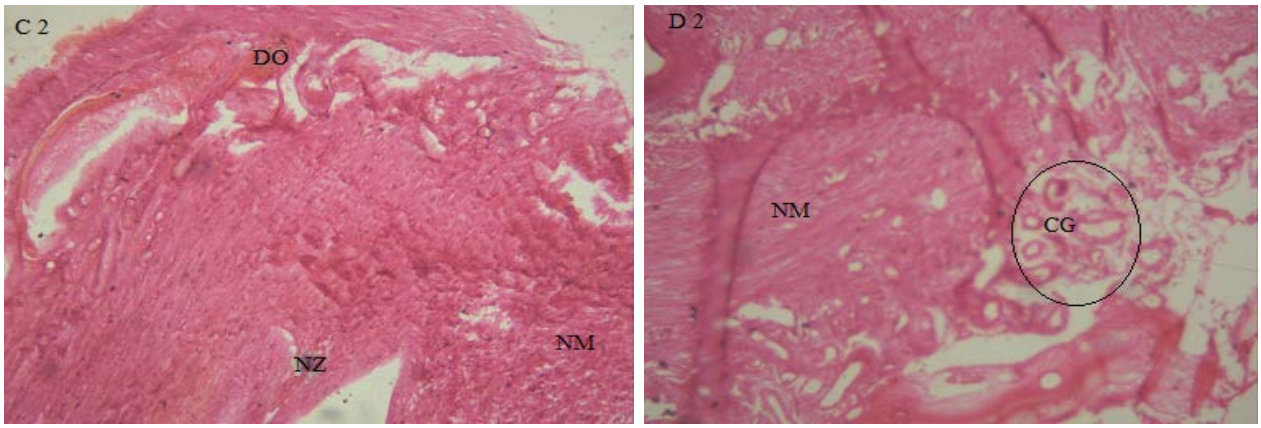
Figures: (1E) Vagina following administration of aqueous extract of *F. vogelii* (300g/kg) for 14 days. OD-Oedema, LP-Lamina propria, and BV-Blood vessel. (H & E stains, 200X.)

The cervix

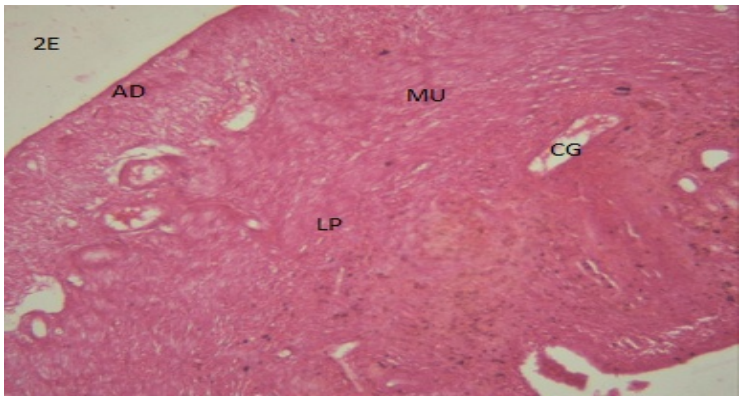
Examination of the negative control and extract group microscopically revealed the presence of a normal structure of cervical mucosa and glands with no alterations (Figures 2A and 2E). After the animals were exposure to 1.5mg/kg lead acetate (positive control), some areas of the cervix presented optically empty spaces, as well as diffuse oedema and cervical wall denudation (Figure 2B), necrotic zones, diffused oedema and cervical glands necrosis were also visibly present. Following the administration of the aqueous extract of F. vogelii, the cervix showed a sign of recovery as presented in Figures C2 and D2 below.



Figures 2A The cervix of group A (negative control) showing the presence of a normal mucosa, LP-Lamina propria and CG-Cervical gland. (2B) The Cervix of lead acetate group (1.5mg/kg). OD-Oedema, FC-Fatty change, ICT-Interconnective tissue, MU-Muscle and OES-Optically empty space. H & E stains, 200X.



Figures (C2) The Cervix of aqueous extract group of *F. vogelii* (100g/kg) for 14 days and 24 hours later exposed to lead acetate (1.5mg/kg) for another 14 days showing DO-Diffused Oedema, NZ-Necrotic Zone and NM-Normal Mucosa. (D2) Cervix following administration of aqueous extract of *F. vogelii* (300g/kg) for 14 days and 24 hours later exposed to lead acetate (1.5mg/kg) for another 14 days showing NM-Normal Mucosa, CG-Cervical Glands H & E stains. 200X.



Figures: (2E) Cervix following administration of aqueous extract of *F. vogelii* (300g/kg) only. MU-Muscle, CG-Cervical glnd, LP-Lamina propria, and AD-adventitia. (H & E stains, 200X).

Discussion

F. vogelli usefulness is not only limited to its use as a vegetable because studies has also confirm its efficacy in herbal remedy[5,6]. Its importance has been tested locally as anti-malaria[8], while some unconfirmed reports also suggested that it may be used as an anti-seizure herb. There is dearth of information on the role of *F. vogelii* as anti-toxicity and so the main focus of this research is to prove that this extract has anti-toxicity effect especially on the reproductive organs (vagina and cervix). Reproductive biologists have focused more on the effects of toxicity on the upper part of the reproductive system such as the ovary, uterus, fallopian tube and its effect on fertility without actually considering that the vagina and the cervix are not only vital for reproduction but also very important part of female reproductive systems. This makes works on vaginal and cervical toxicity sparse to come by. This strongly agrees with the works done by[13,19,24].

There were serious alterations to the histology of the reproductive organs integrity under consideration (figure 1B and 2B) which may hamper female reproduction. Some of the structural changes in the organs include diffuse oedema, necrosis, optical empty spaces and denudation of the mucosal walls as shown is figures 1A to 1E above which are not as serious as that observed in the positive control group. The toxic effects of lead might have been cushioned by the protective power of the extract. The fatty changes seen in groups C and D were not as visible as the one in the lead acetate group (B) which might be due to the protective effect of the extract on the organs.

Flavonoids present in the leave of plants have been shown to possess many pharmacological properties such as: anti-oxidant activities, anti-inflammatory activities, anti-cancer activities and anti-microbial effects[8,30.] Flavonoids might have contributed to the extracts healing (anti-inflammatory) properties as observed from the histological studies [27,29.] *F. vogelii* is very rich in triterpenoids, a compound which plays a very active role in wound healing[28.] According to [26]triterpenoids are shown to strengthen the skin, increase the concentration of antioxidants in wounds, and restore inflamed tissues by increasing blood supply.

Lead toxicity significantly affects the formation of red blood cells[5,12] and most systemic impairments such as the nervous, the urinary, the reproductive and every parts of the body as reported in other literatures show the hazardous and versatile effects of lead in mammals[2,7,9,13,15,18]. It can be noted that the effects of lead on reproductive systems are complex and sex-specific, and involves multiple locations on the hypothalamic–pituitary–gonadal axis[23].

The histo-architectural changes as observed in the present study in the vagina and cervix of female Wistar rats have been able to demonstrate the poisonous effects of lead. With the results of this research, we wish to recommend the use of this leave

F. vogelii as an herbal medicine for the treatment of reproductive toxicity especially that of lead.

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