ACUTE AND SUB-ACUTE TOXICITY STUDIES OF ETHANOLIC STEM AND ROOT EXTRACTS OF *ARISTOLOCHIA RINGENS* AND *SECURIDACA LONGEPEDUNCULATA* IN WISTAR RATS

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ABSTRACT

The aim of this study was to examine the acute and sub-acute toxicity of the ethanolic extract of the stem and root of *Aristolochia ringens* and *Securidaca longepedunculata,* respectively, in Wistar rats. The animals were divided into 5 per group and oral administration of extract at doses of 100, 250, 500 mg/kg were given daily for 28 days. Control group was given distilled water and animals were weighed at 7 day intervals. Animals were kept under close observation for 24 h and 28 days for acute and sub acute toxicity study, respectively. Body and relative organ weight, biochemical and haemotological analysis and phytochemical screening were carried out. The extract did not exhibit significant change in the percentage body weight when compared to the control group. The stem extract of *A. rigens* did not show any significant difference in the weight of the organs, weight while the root extract of *S. longepedunculata* exhibited a significant dose-dependent decrease in the weight of the liver and heart in all the treated groups ($p<0.05$). Extract showed significant increase in red blood cell (RBC), haemoglobin (HGB) and haemotocrit (HCT) levels in *A. ringens,* while it decreased in *S. longepedunculata* extract in the study. There was no significant alteration in the haematological parameters (WBC, MCHC, MCV and MCH) of the treated rats when compared to the control rats. All blood serum biochemical parameters were not significantly ($p<0.05$) different as compared with the control group, except for a significant ($p<0.05$) non-dose-dependent increase of TP, HDL-c and LDL-c of *A. ringens* extract. The result indicate non toxicity of ethanolic stem and root extracts of *A. ringens* and *S. longepedunculata,* respectively, were found to be safe when orally administered.

Keywords: Biochemical indices; Haemotology; Toxicity; Phytochemical; *Aristolochia ringens*; *Securidaca longepedunculata*

INTRODUCTION

Recently, there has been great interest in medicinal plant research. It has opened new field of important materials for the pharmaceutical and cosmetics industries. Studies have shown that approximately half of all synthetic drugs are derived from natural sources[1]. There is growing global demand for herbal medicine and the use and safety call for concern[2]. Traditional medicine as drugs are accepted by the public as it is considered to be safe and natural[3,4], and it is believed that plant remedies are free from undesirable side effects[5]. Deaths or hospitalization as a result of herbs consumption are rare[6].

Several reports have shown the effective therapeutic tendencies of medicinal plants in treating various diseases and other uses include preservatives, flavoring and aroma. However, despite the highly favorable therapeutic potential of these medicinal plants, some its components have shown to be potentially harmful and more or less lethal[7,8]. Despite the various benefits of medicinal plants, there is insignificant scientific claim in literature on the certainty of these plants. As a result, it becomes imperative to evaluate their toxicological effects which could be helpful to providing preliminary safety information regarding potential harmful phytochemicals of these plants.

Aristolochia ringens (Vahl) is known among the Yoruba indigenous of Southwest Nigeria as “Ako-igun” and is a climber of the family “Aristolochiaceae”. Traditionally, the leaves are used in the treatment of rheumatoid arthritis, diarrhea, asthma, antidote and snakebites[9,10]. The root decoction in small doses can be used to treat skin diseases, wound, inflammation, and purgative[11-13]. Different studies in *in vitro* and *in vivo* have demonstrated the antiplasmodial, analgesic, antimicrobial, antioxidant, antivenom, antialzeheimer, antilarvicidal, anti-inflammatory, antiseptic, abortifacient, antispermatogenic and antiulcer activities of *Aristolochia ringens*[14-17].

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Securidaca longepedunculata Fresens is a small tree with a height between 6-12 meters. The local name is popularly known as "Ipeta" It is majorly distributed in different African countries. Ethnomedicinal uses of S. *longepedunculata* revealed that the root extract can be used to treat sexually transmitted diseases, malaria, pneumonia, cough and aches[18-21]; also the stem bark can be used in the treatment of skin diseases, dysentery, stomach ache and typhoid[18, 22-23].

Due to wide range of use of this herbal plants, hence, there is a need to investigate its safety level by placing importance on the acute toxicity and sub-chronic toxicity of the ethanolic roots and stem of *Securidaca longepedunculata* and *Aristolochia ringens,* respectively.

MATERIALS AND METHODS

Extract preparation

The fresh roots of *Securidaca longepedunculata* and stem of *Aristolochia ringens* were collected from the wild in Ilaro, Ogun State, Nigeria in November 2016. Identification and authentication were performed in the Herbarium of the Department of Botany, University of Lagos where the voucher specimen numbers LUH 5570 and LUH 4061 respectively, were deposited. The plant materials were rinsed under running tap water, cut into bits and air dried at temperature 23°C ± 2°C after they were was then pulverized in a mechanical grinder. Each dried plant samples (500 g) root of *Securidaca longepedunculata* and stem of *Aristolochia ringens* was macerated in 5 L of absolute ethanol for 72 h at room temperature, filtered using a Whatman No 1 filter paper and concentrated to dryness under vacuum at 40°C using a rotary evaporator (Buchi, Switzerland R-250). The dried extracts (yield 1.91 and 2.11 % (w/w) respectively was stored in the refrigerator at 4°C until further use of toxicological evaluation. Fresh extracts were reconstituted daily in distilled water to the last concentration for drug administration to the Wistar rats.

Animals

Male and female Albino Wistar rats, weighing 120–140 g, were obtained from the Nigeria Institute of Medical Research, Lagos State, Nigeria (NIMR), Yaba, Lagos, Nigeria. All animals were kept in cages at the Animal house of the Department of Zoology, University of Lagos, Nigeria, and acclimatized for a minimum of 10-days prior to oral administration of the extract. Standard laboratory conditions were maintained in separate clean cages at 23^0 C under regular 12 h daylight/ dark cycle in specific pathogen- free animal facility. The **"principles of laboratory animal** care" [24] guidelines and procedures were followed for the experiments. The animals were fed with standard rodent chow (Pfizer Feeds Ltd) and water ad libitum. Daily cleaning was done to the cage beddings and water bottles.

Acute toxicity

A total of forty five albino Wistar rats were randomly divided into 9 groups. Each (5 per group) had 2 male and 3 female rats. The rats were grouped. Hereafter, Group 1 is the control that was daily treated with distilled water, Group II,III,IV,V stem extract of *A. ringens* and Group VI, VII, VIII, IX root extract of *S. longepedunculata* received 500, 1000, 1500. 2000 mg/kg. The animal feed was kept away in a single night, but had access to water and then treated orally with extract of *A. ringens* and *S. longepedunculata*. The rats were kept under close observation for changes in general behavior, mortality and other physiological disorder for 24 hrs .

Sub-acute studies

Thirty five rats were divided into 7 groups. Each (5 per group) had 2 male and 3 female for the sub-acute studies. The rats were grouped into; Group 1 which serves as the control, which were treated with distilled water daily, Group II,III,IV extract of *A. ringens* and Group V, VI, VII, extract of *S. longepedunculata* received 100, 250, 500 mg/kg. The animals received distilled water (control) for 28 days. After dosing, the rats were fasted of feed but had water ad libitum for 24 h and were sacrificed by cervical dislodgement. Rats were made to bleed from the retro orbital venous plexus and blood samples were collected using capillary tubes for the haematological and biochemical studies.

Body weight and relative organ weight

Throughout the experimental study, the animals were weighed weekly and the percentage of weight change for animal was calculated as thus:

Percentage (%) Weight change = (Difference between interval body weight and initial body weight ÷ initial body weight) ×100. The weight of each organ was standardized for 100 g body weight of individual rat.

Preparation of Serum

About 5 mL of blood sample was collected into ethylene diamine tetra acetic acid (EDTA) sample bottles for various haematological assays while 10 mL of blood sample was collected and centrifuged at 2500 rpm for

5 min and Pasteur pipette was gently used to empty serum into the sample bottles for different biochemical assays.

Serum biochemical analysis

Serum samples were analysed using standard procedures[25], for albumin (ALB), alkaline phosphatase (ALP), alanine transaminase (ALT), aspartate transaminase (AST),[26], total bilirubin (TBIL)[27], lipids triglycerides (TG), total cholesterol (TCHO), high-density lipoprotein (HDL-c), low-density lipoprotein (LDL-c)), total protein (TP)[28], creatinine(Cr) and uric acid (URIC)[29].

Haematological analysis blood sample collected and analysed for red blood cells count (RBC) by haemocytometic method and Haemoglobin (Hb) content was by Cyanmet haemoglobin (Drabkin) method [30]. Other parameters evaluated include white blood cell (WBC) count, mean corpuscular haemoglobin concentration (MCHC), haematocrit (HCT), mean corpuscular volume (MCV) and mean corpuscular haemoglobin (MCH).

Phytochemical screening

Phytochemical screening was performed using standard procedures described in the literature[31-33].

Statistical analysis

Results are expressed as mean ± SEM for change in body weights. Data obtained for haematological and biochemical analysis are expressed as mean ± standard deviation (SD). The data obtained were statistically evaluated using one-way analysis of variance (ANOVA), with SPSS software version 20 The differences were considered statistically significant at level of $p < 0.05$.

RESULTS

Phytochemical screening of both plant extracts showed the presence of reducing sugar, alkaloids, flavonoids, terpenoids, cardiac glycosides, tannins and steroids (Table I). However, anthraquinones were not detected in both plant ethanolic extract. Saponins were absent in the extract of *A. ringens* but there reducing sugar was highly present. On the other hand, saponins were extremely present in the extract of *S. longepedunculata* while its reducing sugar was highly present.

Changes in body weight in the acute test

The acute toxicity study (Table II) of both *A. ringens* (stem) *and S. longepedunculata* (root) extract showed no changes in the behaviour or effects in the physiological disorder. The LD_{50} value of the *A. ringens* (stem) and *S. longepedunculata* (root) extract was greater than 2000 mg/kg and no mortality or morbidity sign was recorded.

Table I: Phytochemical profile of the ethanolic stem and root extract of *Aristolochia ringens* and *Securidaca longepedunculata,* respectively

Phytochemical component	*Aristolochia ringens* (Stem)	*Securidaca longepedunculata (Roots*
Saponin	-	+++
Reducing Sugar	++	++
Alkaloid	+	+
Flavonoid	+	+
Tannins	+	+
Terpenoids	+	+
Anthraquinone	-	-
Cardiac Glycosides	+	+
Steroids	+	+

Key: +++: Extremely present, ++: Highly Present, +: Present, -: Not Detected

Table II: Effect of mortality on the acute toxicity of the ethanolic extract of both *A. ringens* (A)(Stem) *and S. longepedunculata* (B)(Root)

Dosages of drugs (mg/kg)	No of Mice used	Number of dead animals	% Total death of mice
A 500 mg/kg	5	0	00
A 1000 mg/kg	5	0	00
A 1500 mg/kg	5	0	00
A 2000 mg/kg	5	0	00
B 500 mg/kg	5	0	00
B 1000 mg/kg	5	0	00
B 1500 mg/kg	5	0	00
B 2000 mg/kg	5	0	00

Control group received distilled water

Changes in the body weight in the sub-acute The ethanolic stem and root extract of *A. rigens* and *S. longepedunculata* respectively caused no significant ($p<0.05$) change in the percentage body weight in a dose-dependent manner as compared to the control Table III.

Table III Change in animal weight in the sub-acute studies on the ethanolic stem and root extracts of *A. rigens* and *S. longepedunculata* respectively

Study	Dose (mg/kg)	weight change (%)
A. ringens Sub –acute (28 days)	100	23.8 ± 2.12
	250	23.2 ± 1.41
	500	26.1 ± 3.96
S. longepedunculata Sub –acute (28 days)	100	22.0 ± 1.56
	250	29.6 ± 1.56
	500	29.7 ± 1.16
Sub –acute (28 days)	Control	29.1 ± 1.41

Values are expressed as mean ± SEM (n=5). No significant difference (p>0.05) between treated and control rats (One-way ANOVA

No significant difference (p<0.05) in the weight of organs between the control and the treatment groups in the extract of *A. rigens.* The extract of *S. longepedunculata* exhibited a significant dose-dependent decrease in the weight of the liver and heart in all the treated groups (p<0.05) throughout the treatment period as shown in Table IV.

Table IV Changes in organ weights (per 100 g body weight) in the sub-acute study of ethanolic stem and root extracts of *A. rigens* and *S. longepedunculata* respectively

Study	Organ	Dose (mg/kg)			
Sub-acute (28 days)		Control	100	250	500
A. ringens	Liver	3.80 ± 0.25	2.33 ± 0.73	3.08 ±0.62	3.96 ±0.77
	Kidney	1.15 ± 0.12	0.76 ± 0.06	0.80 ± 0.09	0.87 ±0.10
	Heart	1.06 ± 0.15	0.53 ± 0.03	0.49 ± 0.07	0.63 ±0.07
	Testis	2.50 ± 0.17	2.17 ± 0.03	2.81 ± 0.11	2.48 ±0.15
S. longepedunculata	Liver	3.74 ± 0.25	3.85 ± 0.51	3.95 ± 0.39	3.72 ±0.69
	Kidney	1.15 ± 0.12	0.77 ± 0.07	0.84 ± 0.05	0.76 ±0.06
	Heart	1.06 ± 0.15	0.57 ± 0.06	0.54 ± 0.03	0.56 ±0.01
	Testis	2.50 ± 0.17	2.21 ± 0.09	2.44 ± 0.16	2.32 ±0.12

Values are expressed as mean ± SEM (n=5). No significant difference (p>0.05) between treated and control rats (One-way ANOVA

Table V: Values of the haematological parameters of control and treated rats with the ethanolic stem and root extracts of *A. ringens* and *S. longepedunculata,* respectively, in sub-acute toxicity study

Parameter	A100	A250	A500	B100	B250	B500	M500 (1:1)	CONTROL
Red blood cell RBC (x 10^{12}/L)	9.77± 0.003*	6.58 ± 0.003	9.53 ± 0.00*	5.21 ± 0.00*	5.78 ± 0.00	0.81 ± 0.00*	0.78 ±0.00*	5.75± 0.003
Haemoglobin HGB(g/L)	16.42 ± 0.023*	12.82 ± 0.020	12.12 ± 0.020	10.72 ± 0.020	11.92 ± 0.023	7.43 ± 0.033*	15.30 ± 0.000	11.2 ± 0.000
Haemotocrit HCT (%)	71.20 ± 0.023*	52.22 ± 0.023*	43.60 ± 0.023	40.82 ± 0.023	45.32 ± 0.023	6.49 ± 0.205*	8.56 ± 0.367*	43.42 ±0.023
White blood cell WBC (x 10^9 /L)	3.40 ± 0.80	3.46 ± 0.27	3.40 ± 0.80	5.93 ± 0.47	3.24 ± 0.38	4.67± 0.34	3.42 ± 0.79	4.17 ± 0.09
Mean Corpuscular Volume MCV (fL)	72.22 ± 0.02	79.42 ± 0.02	77.22 ± 0.02	78.32 ± 0.02	78.32 ± 0.02	78.42 ± 0.02	74.72 ± 0.02	75.52 ± 0.02
Mean cell Haemoglobin MCH (pg)	18.81 ± 0.01	19.51 ± 0.01	16.2 ± 0.00	20.52 ± 0.02	20.63 ± 0.03	20.22 ± 0.03	19.62 ± 0.03	19.53 ± 0.03
Mean cell Haemoglobin Concentration MCHC (g/dl)	23.33 ± 0.05	24.53 ± 0.05	22.22 ± 0.03	23.20 ± 0.05	21.33 ± 0.05	21.33 ± 0.05	21.63 ± 0.05	24.83 ± 0.05

*Values were expressed as means ± sem, n=5, * $p \leq 0.05$.*

Key: A500, A250, A, 100 (received 500, 250, 100 mg/kg stem extract of A. ringens respectively), B500, B250, B100 (received 500, 250, 100 mg/kg root extract of S. longepedunculata respectively), Control received distilled water

Table VI: Values of the biochemical parameters of control and treated rats with the ethanolic stem and root extracts of *A. ringens* and *S. longepedunculata,* respectively, in sub-acute toxicity study

Parameter	A500mg	A250mg	A100mg	B500mg	B250mg	B100mg	M500mg (1:1)	CONTROL
Aspartate transaminase AST (U/L)	20.90 ± 0.02	18.20 ± 0.02	22.80 ± 0.04	29.90 ± 0.03	45.20 ± 0.05	33.10 ± 0.03	20.90 ± 0.02	43.70 ± 0.04
Total Bilirubin TBIL (mg./dL)	4.10 ± 0.04	3.00 ± 0.03	1.90 ± 0.01	1.80 ± 0.01	4.10 ± 0.04	2.30 ± 0.02	2.40 ± 0.02	3.10 ± 0.03
Creatin Cr (mg/dL)	60.29 ± 0.03	62.77 ± 0.04	54.14 ± 0.02	54.51 ± 0.01	70.63 ± 0.03*	84.31 ± 0.05*	55.75 ± 0.03	58.94 ± 0.02
Alanine TransaminaseALT (U/L)	23.40 ± 0.02	21.20 ± 0.02	22.70 ± 0.03	21.20 ± 0.04	23.50 ± 0.03	17.50 ± 0.02	17.00 ± 0.01	25.80 ± 0.03
URIC (mg/dL)	2.50 ± 0.03	2.90 ± 0.04	2.60 ± 0.03	1.90 ± 0.01	2.70 ± 0.02	3.00 ± 0.02	1.90 ± 0.01	2.10 ± 0.02
Albumin ALB (mg/dL)	40.20 ± 0.02	42.60 ± 0.02	27.40 ± 0.01*	42.80 ± 0.03	38.80 ± 0.02	40.10 ± 0.02	32.20 ± 0.02	37.90 ± 0.02
Total protein TP (g/l)	7.18 ± 0.2*	8.25 ± 0.03*	6.35 ± 0.02	5.81 ± 0.02	6.55 ± 0.02	6.73 ± 0.02	5.03 ± 0.02	5.45 ± 0.01
High density Lipoprotein HDL-c (mg/dL)	4.10 ± 0.03*	3.50 ± 0.02*	2.57 ± 0.01	1.31 ± 0.00	1.11 ± 0.00	1.26 ± 0.01	1.05 ± 0.00	1.67 ± 0.01
Low density Lipoprotein LDL (mg/dL)	2.31 ± 0.03*	1.60 ± 0.02*	1.40 ± 0.02*	0.42 ± 0.01	0.40 ± 0.01	0.58 ± 0.01	0.90 ± 0.01	0.40 ± 0.00
Total Cholesterol TCHO (mg/dL)	3.58 ± 0.02	3.19 ± 0.03	2.47 ± 0.02	4.15 ± 0.03	3.66 ± 0.02	3.81 ± 0.02	2.53 ± 0.01	3.13 ± 0.02
Lipids triglycerides LTG (mg/dL)	0.46 ± 0.23	0.65 ± 0.03	1.50 0.04	0.57 ± 0.03	0.85 ± 0.03	0.90 ± 0.02	1.05 ± 0.03	0.89 ± 0.02
Alkaline Phosphatase ALP (U/L)	62.90 ± 0.02	72.50 ± 0.03	90.60 ± 0.04*	100.90 ± 0.05*	45.50 ± 0.01*	68.00 ± 0.03	64.90 ± 0.03	70.10 ± 0.02

*Values were expressed as means ± sem, n=5, * $p \leq 0.05$.*

Key: A500, A250, A, 100 (received 500, 250, 100 mg/kg stem extract of A. ringens respectively), B500, B250, B100 (received 500, 250, 100 mg/kg root extract of S. longepedunculata respectively) Control received distilled wat

In the sub-acute studies, results of the two plant extracts on haematological parameters presented in Table V showed a significant ($p < 0.05$) decrease of RBC count at the dose of 500 mg/kg of *S. longepedunculata*. However, at 100 mg/kg and 500 mg/kg of *A. ringens, it* exhibited a significant non dose dependent rise in RBC count. Also, a significant ($p<0.05$) non- dose-dependent in HGB at the dose of 100 mg/kg of *A. ringens* was recorded in the course of the study, while a decrease was observed at 500 mg/kg of *S. longepedunculata* in the treated rats. Stem extract of *A. ringens* at the dose of 100 and 250mg/kg exhibited a significant ($p<0.05$) rise in HCT counts. A statistically significant ($p<0.05$) decrease in HCT at 500 mg/kg of root extract of *S. longepedunculata* as compared to control was observed. No significant difference was noted in other haematological parameters (WBC, MCHC, MCV and MCH) when compared to the control group.

TableVI shows the values of biochemical parameters during the sub acute treatment period. Blood serum biochemical parameters were not significantly ($p<0.05$) different when compared with the control group, except for a significant ($p<0.05$) non-dose-dependent increase of TP, HDL-c and LDL-c at the dose of 250 and 500 mg/ kg of the extract of *A. ringens*. Similarly, LDL-c and ALP at the dose of 100 mg/kg of *A. ringens* in treated group exhibited a significant ($p<0.05$) but not dose-dependent increase in the treatment period but the level of ALB was significantly reduced. However, the blood serum levels of Cr and ALT at the dose of (100 and 250) mg/kg and 500 mg/kg of *S. longepedunculata,* respectively, exhibited a statistically significant ($p<0.05$) non dose-dependent rise as compared to control while ALP level at 250 mg/kg of *S. longepedunculata* was decreased significantly.

DISCUSSION

In this present study of acute toxicity, administration of the different doses of both plant extracts did not induce toxicity or mortality in any animal in the course of the entire experimental period. This shows that the ethanolic extract of both plants was well tolerated by the rats. Administration of a least dose of 500 mg/kg dose of plant extract did not reveal toxic effects or mortality in any of the experimental animals. Therefore, the LD_{50} of extract can be regarded to be higher than 2000 mg/kg. According to the Globally Harmonized System (GHS) for chemical tagging and classification[34], substances that possess an LD_{50} value more than 2000 mg/kg are regarded as relatively safe [35]. Some studies have shown a greater therapeutic dose of 2000 mg/kg to have LD_{50} values, based on the GHS standard, such extracts have been relatively considered safe on acute exposure[36-37].

Stem and root extract of *A. ringens* and *S. longepedunculata,* respectively, were examined in animals using analysis of body and organ weights, haematological, biochemical parameters and phytochemical analysis. Body weight change is a key indication of toxic effects of drugs and metabolites[28,38].

Daily administration of both extracts for the sub –acute period indicated no remarkable changes in body weight pattern in the treated animals as compared to the control group. These implied that the drug administration did not produce any critical effect on normal growth and development of the treated animals. Changes that occur in the process of blood cells production from toxicity in human can be a useful evaluation in the data of animal studies [39]. The human blood constituents are vulnerable to foreign and harmful compounds as it serves as a means for drug passage. After 28 days oral administration of stem and root extract of *A. ringens* and *S. longepedunculata,* respectively, the remarkable increase in RBC parameter in the doses of *A. ringens* showed that the plant extract may not be adversely influenced by the erythropoietic system. The significant increase in HCT and HGB of *A. ringens*, also significant decrease in HCT and HGB parameters in *S. longepedunculata* at the highest dose, could suggest that this increase in erythrocytes and thrombocytes may be due to an increase in the rate of hematopoiesis. Clinically, the body generates rapidly cells to meet up for the production of more mature cells as in case of blood loss or dehydration[40]. In this study, significant changes were not recorded in other parameters such as WBC, MCHC, MCV and MCH. Further implication in several toxicity tests have shown that when hematopoiesis is being replenished at a quick rate, it is considered as an accurate target for toxicity[41]. The serum biochemical evaluation in this study was to examine the possible changes in the renal, hepatic and lipid features of different doses as compared to the control group of both extracts, in order to detect the exact type of disease.

Stem and root extract of *A. ringens* and *S. longepedunculata,* respectively, exhibited no significant differences in all the biochemical parameters in the sub-acute toxicity study but for a significant increase in TP, HDL-c and LDL-c TP, parameters at the lowest and highest doses. Evaluation of TP and ALB can serve as a biomarker to test for liver and kidney diseases [41-42]. A study has reported that a rise in these parameters have a hepato-protective effect[43-44]. The biochemical analysis observed in this study revealed some significant changes that were not absolutely dose dependent. The liver and kidney as a result of pharmacological use of herbal product is a biomarker tool for toxicity evaluation. Renal damage can be induced if drugs are taken in high doses such that the kidney destroy these drugs [45]. The serum levels of Cr, ALP and ALT of the two extracts showed a significant non dose-dependent decrease when compared to the control group. These results may seem to suggest that the kidney functions are devoid of toxicity to animals treated with the extract.

The phytochemical screening of the ethanolic extract of *A. ringens* and *S. longepedunculata* showed the absence of anthraquinones and presence of alkaloids, flavonoids, tannins, carbohydrates, cardiac glycosides, terpenoids and steroid in both plant extract. Saponin was absent in *A. ringens* but extremely present in *S. longepedunculata*. The bioactive compounds such as alkaloids, saponins, glycosides, and flavonoids are found in different quantities in the plant which draw out a wide range of pharmacological or therapeutic effects, e.g., saponins enhance nutrient absorption and promote digestion alkaloids are used as medications and recreational drugs which can serve as anaesthetic and stimulant, also, as analgesic morphine and the anti-malarial drug quinine[46].

CONCLUSION

The observations revealed in this study provide preliminary information on the acute and sub-acute toxicological profile of the stem and root extract of *A. ringens* and *S. longipedunculata* respectively. The result suggest that these plants are generally safe and non-toxic to the body weight and relative body organs, haematological and biochemical parameters of rats. However, further investigation on the histopathological evaluation should be done.

Competing interest statement

The authors declare that they have no competing interest

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