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**Ondélé Radard**

Life and Earth Sciences  
Laboratory ENS, UMNG  
Republic of Congo

**Wossolo Nguono Stephane Bertrand**

Laboratoire Pharmacodynamie  
Physiopathologie Expérimentale  
FST Republic of Congo

**Pénéme Max Bonaventure Lazard**

Laboratoire Pharmacodynamie  
Physiopathologie Expérimentale  
FST Republic of Congo

**Makaya Eni Viviane**

Life and Earth Sciences  
Laboratory ENS, UMNG  
Republic of Congo

**Etou Ossibi Arnaud Wilfrid**

Laboratoire Pharmacodynamie  
Physiopathologie Expérimentale  
FST Republic of Congo

**Corresponding Author:****Ondélé Radard**

Life and Earth Sciences  
Laboratory ENS, UMNG  
Republic of Congo

## Acute and subacute toxicity of *Urera trinervis* (Urticacea) Hochs. Ex Kraus leaves in laboratory rats

**Ondélé Radard, Wossolo Nguono Stephane Bertrand, Pénéme Max Bonaventure Lazard, Makaya Eni Viviane and Etou Ossibi Arnaud Wilfrid**

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**Abstract**

The aim of the present work was to study the acute and subacute toxicity of the leaves of *Urera trinervis* (Urticacea) Hochs. Ex Kraus in laboratory rats. The acute and subacute toxicity of the aqueous extract of *Urera trinervis* leaves was studied in accordance with OECD 2008 guideline 425. A single administration of *Urera trinervis* aqueous leaf extract at a dose of 5000 mg/kg in rats did not alter the general behavior of the rats tested, and did not cause any mortality at this dose. The lethal dose 50 (LD<sub>50</sub>) of this extract is above 5000 mg/kg. The extract of the plant leaves causes a significant increase ( $p \leq 0.01$ ) in the weight of the animals. The aqueous extract of *Urera trinervis* leaves (100, 250 and 500 mg/kg P.O.) administered for twenty-eight (28) days to rats showed a decrease in ALAT and ASAT levels, creatinine, triglyceride and cholesterol, and an increase in protein and blood sugar levels. However, at the same doses, the extract caused an increase in red blood cells, lymphocytes and neutrophils, and a decrease in platelets. In view of the results of the toxicological study, the aqueous extract of the plant's leaves still merits in-depth study in order to be given a place of choice in human gastronomy.

**Keywords:** *Urera trinervis*, acute, subacute toxicity

**Introduction**

Since time immemorial, man has used certain plants in his environment for food. *Urera trinervis* is a member of the urticacea family. Its leaves are consumed by the Téké people, an ethnic group in the Republic of Congo. Among them, the plant is known as infula. Its availability in town and especially in rural areas guarantees a low-cost meal for many households. This vegetable is appetizing and invigorating, as many consumers appreciate. At a time when everyone's health is a matter of concern, the natural foods we ingest need to be the subject of food toxicology studies. Food toxicology is understood as the science concerned with the evaluation or analysis of the toxicological risk associated with the ingestion of a food [1-2]. Thus, at the time this study was initiated, the literature gave little or no consideration to the effects of this plant on biochemical and haematological parameters in humans. With this in mind, the aim of this study is to investigate the acute and subacute toxicity of the leaves of *Urera trinervis* (Urticacea) Hochs. Ex Kraus in laboratory rats.

**Materials and Methods****Plant material**

*Urera trinervis* leaves were used as plant material in the various tests of the present work. The leaves of *Urera trinervis* were harvested in Brazzaville (Republic of Congo) in November 2022. A sample of *Urera trinervis* was identified and compared with the herbarium sample from the botany department of the Centre d'Etude des Ressources Végétales (CERVE) in Brazzaville (Congo). The leaves were then dried in the laboratory at room temperature (25-30 °C).

**Animal material**

Wistar albino rats were used for this study. Male and female albino rats aged three (3) months and weighing between 180 and 200 g, bred at the Ecole Normale Supérieure de l'Université Marien NGOUABI de Brazzaville were used. They were fed regularly with free access to tap water.

## Method

### Preparation of aqueous extract of *U. trinervis* leaf bark

Fifty grams (50 g) of *U. trinervis* powder were placed in 500 ml of distilled water and decocted for 15 minutes. After filtration through absorbent cotton and "Wattman" filter paper, the resulting decoction was concentrated in a water bath thermostated at 55 °C, to obtain the brown-colored aqueous extract.

The aqueous extract obtained was stored in a flask. This aqueous extract enabled us to carry out the following experiments Acute toxicity study of *Urera trinervis* aqueous leaf extract in rats The acute toxicity study was carried out in accordance with OECD [3] guideline no. 423 to determine the lethal dose 50 (LD<sub>50</sub>) and the therapeutic dose.

Six (6) albino rats, fasted 24 h before the experiment, were divided into two (2) batches of 3 rats each:

in batch 1 (control), the animals received distilled water at a dose of 0.5 ml/100g body weight; in batch 2, the animals received aqueous extract of *U. trinervis* (5000 mg/kg B.W.). After administration of the single dose of product, the animals' behavior was observed every 30 minutes for 4 hours. Observations included: ptosis, stool condition, aggressiveness, reaction to external stimuli, vocalization, vomiting. Lethality was observed for 48 hours. Animal weight was measured every 2 days for 2 weeks.

Subacute toxicity study of *Urera trinervis* aqueous leaf extract in rats OECD guideline No. 423 [3] was used for the subacute toxicity study.

## Results

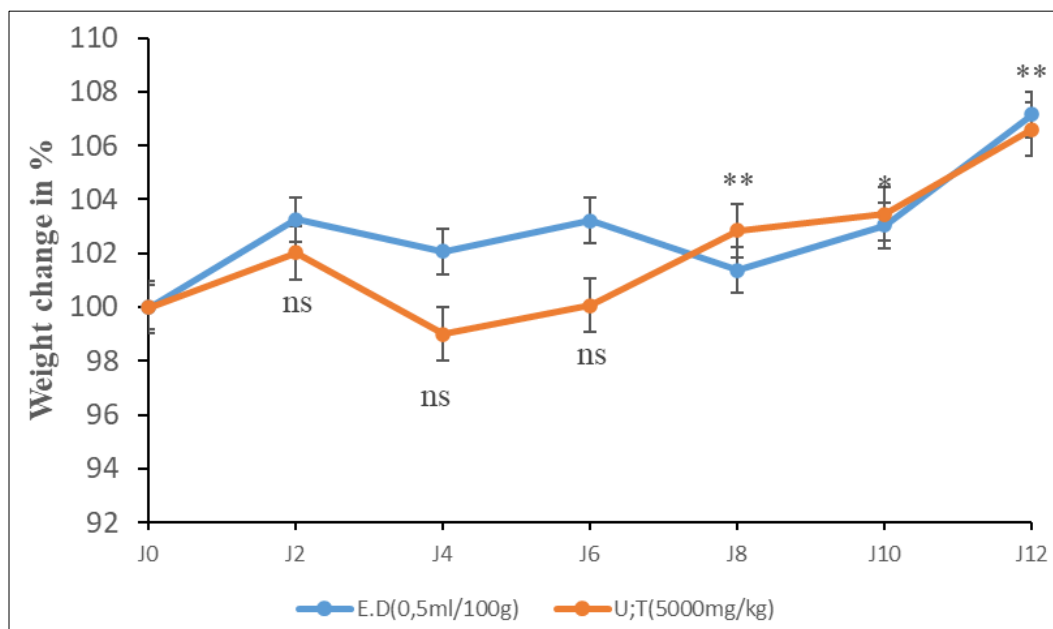
### Effect of aqueous extract of *Urera trinervis* leaves on general behavior and lethality in rats

**Table I:** General condition of animals after single administration of aqueous extract of *Urera trinervis* leaves

Parameters	Distilled water (0, 5ml /100 kg)			<i>Urera trinervis</i> aqueous extract (5000 mg/kg)		
	PAD	PAG	OD	T	Q	D
Mobility	N	N	N	N	N	N
Vigilance	N	N	N	N	N	
Aggressiveness	N	N	N	N	N	N
Ptosis	A	A	A	A	A	A
Stool condition	N	N	N	N	N	N
Piloerection	A	A	A	A	A	A
Vomiting	A	A	A	A	A	A
Vocalization	A	A	A	A	A	A
Reaction to stimuli	N	N	N	N	N	N
Lethality	0	0	0	A	A	A

N; Normal; A: absent

### Change in relative weight of rats during acute toxicity



**Fig 1:** Effect of aqueous extract of *Urera trinervis* leaves on weight changes during acute toxicity

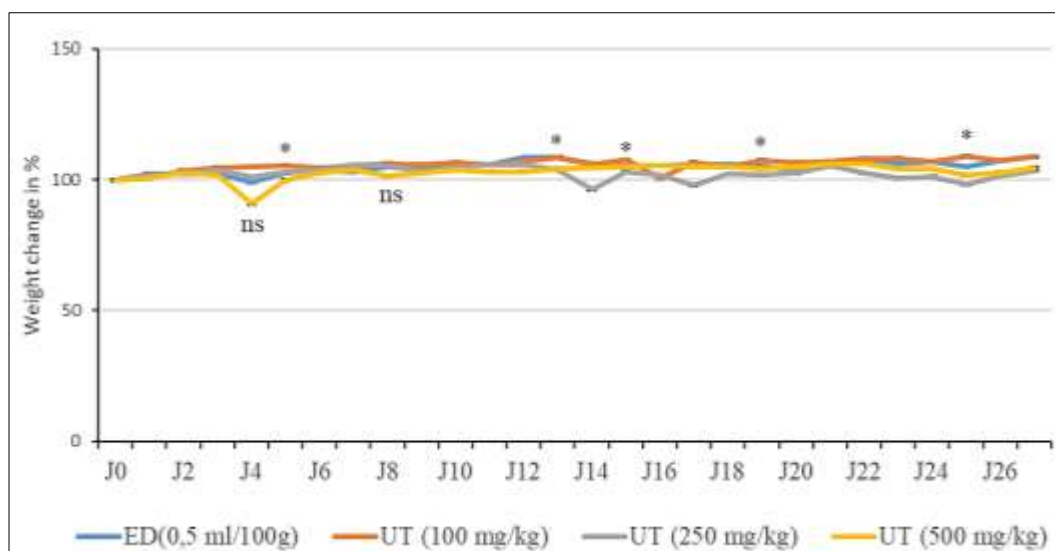
Effect of aqueous extract of *Urera trinervis* leaves on subacute toxicity in rats

Fig 2: Effect of aqueous extract of *Urera trinervis* leaves on weight changes during subacute toxicity

The aqueous extract of *U. trinervis* leaves (100, 250 and 500 mg/kg per os) caused a constant weight change in the animals,

comparable to that observed in distilled water control animals (0.5 mg/kg) (Figure 2).

Effects of aqueous extract of *U. trinervis* leaves on biochemical parameters in rats

Table 2: Effects of aqueous extract of *U. trinervis* leaves on biochemical parameters in rats

Biochemical parameters	Distilled water (0.5 ml/100 kg)	Aqueous extract (100 mg/kg)	Aqueous extract (250 mg/kg)	Aqueous extract (500 mg/kg)
ALAT (UI/L)	24,06±4,56	17,01±2,62 NS	14,5±2,21 *	19,53±4,59 NS
ASAT (UI/L)	93,35±5,61	84,73±9,55 NS	67,08±3,79 *	87,33±7,02 NS
Créatinémie (mg/l)	0,92±0,08	0,76±0,09 NS	0,81±0,11 NS	0,94±0,13 NS
CT (g/l)	104,75±16,07	86,12±14,97 NS	97,56±8,91 NS	110,48±7,61 NS
HDL-Cholestérols (g/l)	56,75±14,93	94,52±6,27 NS	80,24±5,29 NS	101,35±7,53 NS
Glycemia (g/l)	1,39±0,19	2,30±0,41 NS	2,71±0,60 NS	1,54±0,36 NS
PT (g/l)	4,95±0,42	7,17±0,42 NS	5,79±0,42 NS	5,79±0,42 NS
TG (g/l)	277,16±166,99	84,74±3,34 NS	78,6±16,69 NS	114,71±15,55 NS

Table 2 shows the effect of *Urera trinervis* aqueous leaf extract on biochemical parameters in rats.

Effects of aqueous extract of *U. trinervis* leaves on haematological parameters in rats

Table 3: Effects of aqueous extract of *Urera trinervis* leaves on haematological parameters in rats.

Hematological parameters	Distilled water (0.5 ml/100 g)	Aqueous extract (100 mg/kg)	Aqueous extract (250 mg/kg)	Aqueous extract (500 mg/kg)
GR( $10^6$ /mm <sup>3</sup> )	7,48±0,12	8,08±0,14 **	7,77±0,36 **	7,95±0,14 **
Platelets ( $10^3$ /mm <sup>3</sup> )	1278,75±25,19	939,98±27,18 **	1070,5±65,01**	1055±57,25 **
G B ( $10^3$ /μL)	4,43±0,689	4,43±0,266**	1,972±0,573 **	4,047±0,776 **
Neutrophil	0,81±0,19	1,64±0,42**	0,34±0,10**	0,79±0,23**
Lymphocyte	3,43±0,46	2,52±0,50**	2,11±0,24**	3,52±0,25**

## Discussion

The aim of this study was to investigate the acute and subacute toxicity of *Urera trinervis* (Urticaceae) Hochs.Ex Kraus leaves in laboratory rats. At the end of the study, it was found that the aqueous extract of the plant's leaves, administered at a single dose of 500 mg/kg, caused [no change in the study parameters and no death in the animals after 48 h of observation (Table I). The plant extract was well tolerated by the animals. For this reason, the lethal dose 50 of the aqueous extract of *Urera trinervis* leaves is above 5000 mg/kg. It is therefore classified under the Globally Harmonized System (GHS) as a category 5 substance of relatively low toxicity [3]. Animal weight measurements taken during this study showed that administration of the aqueous

extract of this plant's leaves resulted in an increase in animal weight. This increase is attributed to the proper feeding of the experimental animals. Previous studies on plant extracts have also shown an increase in the weight of animals, as in the case of aqueous extracts of *Ceiba pentandra* (Bombacaceae) [4]. This shows that the aqueous extract of the leaves administered undoubtedly stimulates protein synthesis. Many authors working on the acute toxicity of medicinal plants have reached this conclusion, such as Mba Akue [5] who worked on the aqueous extract of *Hallea ledermannii*, Krause and Mikolo [6] on the aqueous extract of *Tetracera potatoria* leaves and Etamé [7] on the wine extract of *Carica papaya* seeds. Furthermore, repeated administration of the aqueous extract *Urera trinervis* (100, 250 and 500 mg/kg) for twenty-eight

(28) days resulted in a constant change in the weight of the animals, an observation that would be due to the repeated effects of consuming the plant extract, resulting to some extent in a state of repression. In humans, when subjected to the same diet for a given period of time, alliesthesia and consequent loss of appetite appear to be the cause of the lack of weight gain. Analysis of biochemical parameters resulting from administration of *U. trinervis* aqueous extract at doses of 100, 250 and 500 mg/kg, shows a reduction in ALAT and ASAT (liver enzymes). The decrease in the levels of these two enzymes shows that the aqueous extract of *U. trinervis* acts at liver level to protect it; the extract of *U. trinervis* leaves has hepatoprotective properties. This result was also found by Lekounda [7], Etame [8] whose work focused on the aqueous extract of *Vitex madiensis* oliv leaves and the aqueous extract of *Carica papaya* seed wine respectively. Aqueous extract of *U. trinervis* (100, 250 and 500 mg/kg) in rats reduces creatinine, total cholesterol and triglycerides. The decrease in creatinine indicates that *U. trinervis* aqueous extract acts favourably on the kidney, thus promoting renal function [8-11]. Triglycerides and cholesterol have a negative effect on blood circulation in the vessels, and the reduction in their blood levels after treatment of rats with aqueous extract of *U. trinervis* suggests that, like many other foods, consumption of the leaves of this plant should be encouraged in humans to prevent the risk of cardiovascular accidents, as emphasized by numerous authors such as Mikolo [6]. Analysis of these results showed high blood sugar levels at all three doses, indicating that *U. trinervis* leaves provide the body with glucose, and therefore have hyperglycemic properties. *U. trinervis* leaves are therefore an energizing food for the body. As for the increase in protein levels, it should be noted that the plant extract at doses of 100, 250 and 500 mg/kg has hyperprotidemic properties. This explains the increase in animal weight in the acute toxicity study mentioned above. The blood parameters analysed in this study gave results which can be interpreted as follows: the aqueous extract of *U. trinervis* at doses of 100, 250 and 500 mg/kg caused a significant increase ( $p < 0.01$ ) in red blood cells. This suggests that *U. trinervis* leaves should be recommended in the diet of subjects deficient in red blood cells, such as sickle-cell anemia patients or accident patients, as they are capable of causing polycythemia in humans. The increase in lymphocytes and neutrophils means that the plant has hyperlymphocytic properties. But in this analysis, we also observed a reduction in platelet levels, as platelets play a very important role in blood coagulation. This leads us to conclude that *Urera trinervis* leaves are unfavorable in cases of hemorrhage. This result corroborates those of James [12], who worked on the aqueous extract of *Polygala fruticosa*.

### Conclusion

Analysis of the acute toxicity results of the aqueous extract of *Urera trinervis* leaves at a dose of 5000 mg/kg in rats shows that the plant's leaves do not alter general behavior and do not cause death in rats at this dose. The lethal dose 50 (LD<sub>50</sub>) of the leaves of this plant is higher than the dose of 5000 mg/kg. *Urera trinervis* leaves are non-toxic. Repeated administration of the aqueous extract of *Urera trinervis* at doses of 100, 250 and 500 mg/kg causes a decrease in ALAT and ASAT levels, creatinine, triglyceride and cholesterol, and an increase in protein and blood sugar levels. However, at the same doses, the extract increases red blood cells, lymphocytes and neutrophils, and decreases platelets. In view of these results,

*Urera trinervis* leaves are a good food to consume with fewer risks to human health.

Conflict of interest

This work presents no conflict of interest

### Acknowledgements

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