Sahel Journal of Life Sciences FUDMA (SAJOLS)
September 2025 Vol. 3(3): 68-70
ISSN: 3027-0456 (Print)
ISSN: 1595-5915 (Online)
DOI: *https://doi.org/10.33003/sajols-2025-0303-09*

Research Article

Acute Liver Impact of Aqueous *Parkia biglobosa* Seed Extract in Experimental Rats

[*]R. A. Abdullahi[1], B. F. Muhammad[2], and A. Abubakar[1]

[1]Nigerian Institute for Trypanosomiasis Research PMB 2077 Kaduna, Nigeria
[2]Department of Animal Science, Bayero University, PMB 3011, Kano, Nigeria
***Corresponding Author's email*: ramatuabdullahi2@gmail.com**

ABSTRACT

There is a global resurgence in the use of herbal preparations, and in some developing countries, including Nigeria, it has been gradually integrated into the primary and secondary health care systems. Nearly all societies have used herbal materials as sources of medicines, and the development of these herbal sources of medicines depends on local botanical flora, of which the effects are not usually known. The study aimed to investigate the acute effects of aqueous seed extract of *Parkia biglobosa* on liver functions in Wistar albino rats. Acute toxicity was performed via the intraperitoneal route to determine the LD_{50}. The animals were subsequently sacrificed, and liver functions were assessed using standard techniques. The acute intraperitoneal toxicity result, $LD_{50,}$ revealed *Parkia biglobosa* aqueous seed extract to be non-lethal at 5000mg/kg bodyweight. The results obtained for liver function parameters indicated that ingestion of *Parkia biglobosa* seed extract has no toxic effect on liver functions. The results can form the basis for further clinical trials.

Keywords: Extract; Liver; *Parkia biglobosa*; Rats; Toxicity

Citation: Abdullahi, R.A., Muhammad, B.F., & Abubakar, A. (2025). Acute Liver Impact of Aqueous *Parkia biglobosa* Seed Extract in Experimental Rats. *Sahel Journal of Life Sciences FUDMA*, 3(3): 68-70 DOI: *https://doi.org/10.33003/sajols-2025-0303-09*

INTRODUCTION

The African Locust bean tree *Parkia biglobosa* (jacq) is a perennial tree legume, belonging to the sub-family Mimosoideae and family Leguminosae. The plant has been used as a source of food, medicinal agents, and timber and is of commercial value. *P. biglobosa* is called by the Hausa people of Northern Nigeria as Dorowa, while amongst the Yoruba it's known as Irugba or Igba and the Ibos call it Ogili Okpi (Udobi, 2010). Plant derived products have been used for medicinal purposes for centuries. At present, it is estimated that about 80% of the world population relies on botanical preparations as medicines to meet their health needs (Shri, 2003). Herbs and spices are generally considered safe and proved to be effective against certain ailments; on the other hand, literature has documented severe toxic reactions from the use of herbs on many occasions (Oduola *et al.*, 2010). Different parts of *Parkia biglobosa* have been reported to possess medicinal properties. Extracts of the plant have been reported to have anti-trypanocidal, antimalarial (Modupe *et al.*, 2011) and antibacterial activities (El-Mahmood, 2007). Growing misuse of antibiotic and chemotherapeutic agents leading to drug resistance is now pushing a considerable proportion of people in both developed and developing countries to the use of herbal medicines (Ajaieogba, 2002). Herbs are generally considered to be safe and proved to be effective against certain ailments. Literature on the other hand, has documented severe toxic reaction from the use of herbs on many occasions. Still, the potential toxicity of herbs has not been recognized by the general public or by professional groups of traditional medicine (Deng, 1994). Patients often think of herbs as natural alternative to chemicals, failing to recognize that herbs are composed of bioactive chemicals some of which maybe toxic (Tyler, 1994). The liver is prone to xenobiotic induced injury because of its central role in xenobiotic metabolism and its anatomic and physiological structure. Many xenobiotics are capable of causing some degree of liver

injury. The ingestion of herbs and its effects on the liver remain largely unknown (Oduola *et al*., 2010).

MATERIALS AND METHODS

Plant materials and preparation of plant extract

The seeds of *P. biglobosa* (jacq) were obtained within Samaru Zaria and was identified by U. S. Gallah in the Department of Biological Sciences ABU Zaria with identification no 2846 in the Departmental herbarium. Seeds weighing 600g were pounded using pestle and mortar after which it was soaked in separating funnel using distilled water for 24hrs after which it was filtered. After filtration, the filtrate was poured into an evaporating dish to concentrate to dryness inside a water bath at 45^0-50^0C. After concentration, it was scrapped from the dish and stored in an appropriate container.

Experimental Animals

Male and female Wistar albino rats (170-230g) were obtained from the Nigerian Institute for Trypanosomiasis Research (NITR), Kaduna, Nigeria. They were housed in appropriate rat cages and were fed with grower's mash (Vital feeds) and were watered *ad libitum.*

Acute toxicity study/LD_{50} Determination

Nine rats were divided into three groups of three rats per group. The three groups were administered intraperitoneally with graded doses of 10,100,1000mg/kg/bodyweight of the extract respectively. The rats were observed for number of deaths and behavioral changes for twenty-four hours. Based on percentage survival rates, the second phase was carried out. Another three rats were divided into three groups and they received graded doses of 1600, 2900 and 5000mg/kg/bodyweight of the extract respectively. The LD_{50} is calculated as the geometric mean of the highest non-lethal and lowest lethal dose (Lorke, 1983). The rats were weighed and blood samples collected through cardiac puncture under chloroform anesthesia into lithium heparin specimen bottles for biochemical analysis. Liver Function Tests (LFT) was performed on the blood samples.

RESULTS

In the acute toxicity study, no death was recorded even at the highest dose of 5000mg/kg/bodyweight via intraperitoneal routes. Table 1 indicates that the LD_{50} of the plant is 5000mg/kg/bodyweight. The values of total and conjugate bilirubin, total protein, albumin and globulin as well as the alkaline phosphate obtained for the study groups showed no statistical difference ($P>0.05$) between the study and control groups. This is demonstrated in Table 2.

Table 1. Showing Overall Acute Toxicity Outcome

Experiment	Dose (mg/kg/BW)	Proportion of animals dead		
		After 24 hours	After 48 hours	After 2 weeks
Phase 1	10	0/3	0/3	0/3
	100	0/3	0/3	0/3
	1000	0/3	0/3	0/3
Phase 2	1600	0/1	0/1	0/1
	2900	0/1	0/1	0/1
	5000	0/1	0/1	0/1

Observation: The LD_{50}> 5000mg/kg/bodyweight

Table 2. Showing Liver Function Test Profiles

Parameters	Extract treatment (mg/kg/bodyweight)						
	Control	10	100	1000	1600	2900	5000
Total Biluribin	14.7±0.7	12.9±0.6	14.3±0.5	12.5±0.4	15.5±0.1	15.6±0.6	15.5±0.1
Conjugate Biluribin	5.7±0.6	5.7±0.6	5.7±0.6	5.7±0.6	5.7±0.6	5.7±0.6	5.7±0.6
Total protein	64.9±7.1	62.4±5.4	66.5±8.7	62.3±4.1	66.5±8.7	64.5±8.7	64.5±8.7
Albumin	33.9±2.0	33.9±2.0	34.6±1.8	33.1±1.1	34.6±1.8	34.6±1.8	34.6±1.8
Globulin	22.5±5.9	28.7±6.24	29.5±3.2	27.4±4.9	31.1±5.1	31.1±5.1	31.1±5.1
ALkpo4	6.1±0.1	4.8±0.3	6.1±0.6	6.1±0.1	6.1±03	3.4±0.8	9.1±0.3

DISCUSSION

Investigation of the acute toxicity is the first step in the toxicological investigation of an unknown substance. The index of acute toxicity is the LD_{50}. However, LD_{50} should not be regarded as a biological constant, since differing results are obtained on repetition or when the

determinations are carried out in different laboratories (Lorke, 1983) due to many variables such as animal species, age, gender, diet, bedding, ambient temperature and time of day hence there are considerable uncertainties in extrapolating LD_{50} value obtained for specie to species. Consequently, recognizing LD_{50} test as providing, at least only a ballpark estimate of human lethality has been advocated (Zbinden, 1981). The result of acute intraperitoneal toxicity of crude aqueous seed extract of *P. biglobosa* was found to be 5000mg/kg/BW as no mortality was recorded in any group of the experimental rats. In an acute toxicity test of *P. biglobosa* leaf extract Modupe (2011), extract was documented to be non-lethal at 5000mg/kg/BW. The current LD_{50} values based on acute oral toxicity recommended by the Globally Harmonized System of classification and labeling of chemicals indicates that category 5,>2000mg/kg≤5000mg/kg (warning; maybe harmful if swallowed and LD50>5000mg/kg (not classified; no specified label) hence, the LD_{50} greater than 5000mg/kg is an indication that the extract maybe safe for human consumption, confirming the believe that *P. biglobosa* is generally not harmful (Link/URL, 2003). The values obtained for the liver function parameters showed that the conjugating ability of the liver was not compromised based on the total and conjugating bilirubin levels. The synthetic ability of the liver was also maintained judging from the total protein and albumin levels.

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