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Dissecting the Acute Oral Toxicity Profile of *Spondias pinnata* (Linn. F.) Kurz Aqueous Seed Extract in Wistar Rats

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KEYWORDS

Spondias pinnata, Acute Oral Toxicity, Subacute Toxicity, Hematological Indices, Histological Assessment, LD_{50} value, Inflammation, etc.

ABSTRACT:

Background: *Spondias pinnata* (Linn. F.) Kurz., commonly known as hog plum, is utilized in traditional medicine for its purported therapeutic properties. Despite its widespread use, comprehensive toxicological assessments of its seed extract remain limited. This study aims to evaluate the acute toxicity profiles of *Spondias pinnata* seed extract in Wistar rats to ensure its safety for medicinal applications.

Methods: Acute toxicity was evaluated according to OECD Guideline 423 by giving a single oral dose of 2000 mg/kg body weight of the seed extract to female Wistar rats. The rats were monitored for 14 days to check for any signs of adverse effects or mortality. Throughout the study, parameters such as clinical signs, body weight changes, food and water consumption, hematological and biochemical parameters, and histopathological examinations of vital organs (liver, kidney, heart, and spleen) were monitored and analyzed.

Results: In the acute toxicity study, no mortality or significant behavioral changes were observed in rats administered up to 2000 mg/kg, indicating a high safety margin for acute exposure. *Spondias pinnata* seed extract did not produce any significant adverse effects on body weight, food and water intake, hematological, renal, or liver function indices compared to the control group. Histological assessment of vitals and reproductive organs showed normal cellular architecture; only liver showed minor signs of inflammation, with few lymphocytic infiltrates in both the control and treatment groups, but it did not show any toxicological relevance to the extract.

Conclusion: The acute toxicity study's result suggests that the LD_{50} value of aqueous seed extract of *Spondias pinnata* was estimated to be greater than 2000 mg/kg, b.w. These findings support the traditional medicinal use of *Spondias pinnata* seeds and suggest that the aqueous extract is relatively safe for further pharmacological and clinical evaluations within the doses and period of investigation in this study. However, long-term toxicity studies are recommended to fully establish its safety profile.

1. INTRODUCTION:

Toxicology is Study of hazardous, poisonous and undesirable consequences of medications and some other chemical components present in plants that may raise the risk of lethality or diminish general health parameters both physically and mentally[1]. As per US Food and Drug Administration (FDA), testing of new compounds in animals for pharmacological action and potential toxicity is crucial (21CFR Part 314)[2]. In order to evaluate whether a new drug is safe and to detect substances that can potentially do more damage than good, toxicology testing uses animal models. Toxicological studies are essential to determine the potential adverse effects, establish safe dosage ranges, and ensure that the benefits of herbal product outweigh any associated risks[3]. Natural products have long been a cornerstone of traditional medicine, offering a rich source of bioactive compounds with therapeutic potential. Herbal products are often considered safe or of low toxicity due to their extensive historical use by humans[4,5]. Now-a-days the usage of herbal treatments is increasing for a variety of ailments. It is crucial to carry out toxicity research on medicinal herbs in order to determine their safety profile, as safety is still a big concern with their use. Hence, toxicological studies on medicinal plants that is meant for use in animals or humans are crucial, and there is a requirement to verify their traditional uses. Among these, *Spondias pinnata* (Linn. F.) Kurz., commonly known as "*Spondias*

Journal of Chemical Health Risks
www.jchr.org
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mangifera", has been utilized extensively in various traditional medicinal systems for its purported health benefits. The seed extract of *Spondias pinnata* is particularly revered for its wide range of therapeutic applications, including anti-inflammatory, antioxidant, and antimicrobial properties[6]. Despite its widespread use in ethnomedicine, there is a notable gap in the scientific literature regarding the comprehensive toxicological evaluation of *Spondias pinnata* seed extract. To address this gap, the present study aims to evaluate the safety of *Spondias pinnata* seed extract through a systematic investigation of its acute toxicity in Wistar rats. By adhering to internationally recognized guidelines, this research seeks to provide a foundational understanding of the extract's safety, supporting its potential use in pharmacological and clinical applications. Specifically, the study follows the OECD Guidelines 423 to assess the acute toxicity profiles, ensuring a rigorous evaluation of the extract's impact on various physiological parameters. This study enhances our understanding of *Spondias pinnata* and establishes a foundation for future research into its therapeutic possibilities. The findings are expected to inform both traditional practitioners and modern researchers, promoting the safe and effective use of *Spondias pinnata* seed extract in medical practice.

Spondias pinnata is an evergreen deciduous tree native to India, Sri Lanka, and Southeast Asia. It belongs to the Anacardiaceae family[7]. *Spondias pinnata*, commonly called as Indian hog-plum in English, amara in Hindi, amra in Bengali, and amrataka in Sanskrit, is a medicinal, nutritional, and economic plant. The seeds *Spondias pinnata* contains ellagitannins, gallotannins, quercetin, kaempferol, rutin, caffeic acid, saponins, steroids, glycosides etc[8]. These constituents contribute to the medicinal properties of *Spondias pinnata* including its antioxidant, anti-inflammatory, and antimicrobial properties.

2. MATERIALS AND METHODS:

2.1. Plant Material Collection and Authentication:

Fruits of *Spondias pinnata* were collected from the local area of Gaya District, Bihar, India, in January 2022. To facilitate fermentation, the fruits were submerged in water for several days. Post-fermentation, the pulp was separated, and the seeds were thoroughly washed and air-dried in a sun-shade for two days. Authentication of the plant material was carried out by Prof. Vijai Malik from the Botany Department at Chaudhary Charan Singh University, Meerut, Uttar Pradesh, India. A voucher specimen with reference number Bot/654 was deposited at the Chaudhary Charan Singh University Herbarium, and the authentication documentation was submitted to the School of Pharmacy at Bharat Institute of Technology, Meerut.

2.2 Preparation of Aqueous Extract:

The dried seeds of *Spondias pinnata* were coarsely powdered. A Soxhlet apparatus was used to extract the powder with distilled water. Specifically, 50 g of the dried powder was extracted using 400 mL of distilled water over 8 hours, with 6-7 cycles at a temperature of 60°C, following the method described by Attanayake et al. (2015)[9,10]. The resulting extract was then concentrated using a hot water bath evaporator under reduced pressure until a semi-solid mass was obtained. The aqueous extract, brown in appearance, was weighed and stored at 4°C for future use. The extraction yield was calculated.

2.3 Phytochemical Screening:

The aqueous seed extract of *Spondias pinnata* underwent preliminary phytochemical screening using the established methods described by Khandelwal and Kokate to detect various phytoconstituents[11,12].

2.4 Experimental Animals:

The study received approval from the IAEC at Bharat Institute of Technology, Meerut, Uttar Pradesh (Reg. No. 1157/ab/07/CPCSEA). Adhering to CPCSEA guidelines, young adult Wistar albino rats (*Rattus norvegicus*) of both sexes, weighing 150-200g and aged 8-12 weeks, were obtained from the institute's animal house. The rats were maintained under standard conditions, including a 12-hour light/dark cycle, a temperature range of 24-28°C, and unrestricted access to food and water.

2.5 Acute Toxicity Study of Aqueous Seeds Extract of *S. Pinnata:*

The acute toxicity study followed the OECD Guideline 423. Twelve female rats were selected for the experiment and were randomly assigned into two groups, with each group comprising six rats. The experimental protocol was carried out over a period of 14 days[13,14,15].

Journal of Chemical Health Risks

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JCHR (2025) 15(3), 1528-1537 | ISSN:2251-6727

Table 1: Experimental Design for Acute Toxicity Study

Groups	Groups Specifications	Intervention Dose	No. of Female Rats
Group I	Normal Control Group (NC)	Animals of normal control group were treated with distilled water (0.5 ml/day, p.o.)	6
Group II	Test Group (TG)	Animals of test group were treated with aqueous seeds extracts of *Spondias pinnata* (2000 mg/kg of b.w., p.o.)	6

2.5.1 Animal Preparation and Dosing:

Prior to dosing, the animals were fasted overnight, with only food withheld. On the day of dosing, the animals were weighed, and the test material, *Spondias pinnata* aqueous seeds extract (AESP), was administered orally via gavage at 10:00 a.m. The starting dose of AESP was 2000 mg/kg body weight, with a dosage volume of 0.1 ml per 100 g of body weight. The control group received 0.5 ml/day of distilled water orally for 14 consecutive days.

2.5.2 Observation Period:

The observation period extended for 14 days post-dosing. General clinical observations were recorded daily at 10:30 a.m., while overall health, morbidity, and mortality were monitored twice daily at 10:00 a.m. and 4:00 p.m., in accordance with OECD Guideline 423[16].

2.5.3 Evaluation Parameters:

All of the rats were kept on a 24-hour fast on the 14th day after dosing. On the 15th day, blood samples were collected via cardiac puncture for hematological and biochemical analysis. The testes samples were outsourced to Aman Pathology Laboratory in Hastinapur, U.P., registered under number 5053101170216028. The study monitored the following pharmacological parameters:

2.5.3.1 General Appearance and Behavioural Observations:

Clinical observations included changes in fur, skin, sub-cutaneous swellings, changes in mucous membrane and eyes, respiratory abnormalities, color and consistency of the faeces, coma, tremors, convulsions, lethargy, diarrhoea, death, signs of toxicity, % body weight changes, food and water intake were monitored.

2.5.3.2 Hematological and Biochemical Estimation:

On the fifteenth day, blood samples were collected via cardiac puncture for hematological and biochemical analysis. Blood was divided into two tubes, one with and one without the anticoagulant EDTA. The non-anticoagulant samples were allowed to coagulate, then centrifuged at 4°C and 4000 rpm to isolate serum. Isolated serum was used for the biochemical parameters such as kidney and liver function tests, lipid profile, and fasting blood glucose levels.

Hematological tests were immediately conducted on the EDTA-treated blood, including assessments of Hemoglobin (Hb), Total Leucocyte Count (TLC), Differential Leucocyte Count (DLC), Mean Corpuscular Volume (MCV), Mean Corpuscular Hemoglobin (MCH), Mean Corpuscular Hemoglobin Concentration (MCHC), Platelet Count (PC), Red blood cell count (RBC).

2.5.3.3 Histopathological Findings:

On the fifteenth day, the rats were weighed and then euthanized using an overdose of anesthetic ether[17]. For histopathological examination, vital internal organs (kidney, liver, spleen, stomach, and heart) along with reproductive organs (ovaries) were carefully extracted through a midline abdominal incision. The organs were then preserved in a 10% buffered formalin solution. Histological slides were prepared at a certified processing facility (Singh Histology Processing Center, Chhatarpur Extn., New Delhi) and examined under a light microscope at 10x magnification to identify any pathological changes in the treated and control groups. Photomicrographs of the tissue sections were also captured.

Journal of Chemical Health Risks

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2.6 Statistical Analysis:

All statistical analyses were performed using GraphPad Prism (version 5.0) to compare and evaluate data significance. ANOVA, followed by Bonferroni posttest and Student's t-test, were employed. A p-value greater than 0.05 ($P > 0.05$) was considered statistically non-significant.

3. RESULTS:

3.1 % Yield of Aqueous Seed Extract of *Spondias Pinnata*:

The % yield of aqueous seed extract of *Spondias pinnata* (AESP) was found to be 4.64±0.04% (% mean±SD).

3.2 Phytochemical Screening:

Phytochemical analysis of *S. pinnata* seeds was conducted using specified procedures to detect various compounds. The preliminary screening of the aqueous extract of the seeds revealed the presence of tannins, diterpenes, triterpenoids, flavonoids, and phytosterols, while alkaloids, carbohydrates, glycosides, proteins, and amino acids were not detected.

3.3 Results of Acute Toxicity Study:

No fatalities or notable behavioral changes were detected in the rats given up to 2000 mg/kg of *Spondias pinnata* seed extract. The animals exhibited normal respiratory, circulatory, behavioral patterns (salivation, tremors, convulsions, lethargy, diarrhoea, sleep, coma). No changes were found in fur, skin, mucous membrane, eyes, color and consistency of the faeces. Weekly water consumption in rats treated with AESP at 2000 mg/kg was slightly higher compared to the normal control rats. During the first week, AESP-treated rats ate slightly less food than the control group, but overall food intake was similar between both groups. Body weight changes over the 14 days showed no statistically significant difference between the treatment and control groups ($P>0.05$). All rats survived and gained weight throughout the trial. No signs of toxicity were noted during the 14-day observation period. These findings suggest that the LD50 value of the extract is greater than 2000 mg/kg, indicating a high safety margin for acute exposure. The results of general appearance and behavioural patterns were presented in Table 2.

Table 2: Effect of AESP on General Appearance and Behavioural Patterns on Rats in Acute Toxicity Study

Observations	30 min		4 hrs		24 hrs		48 hrs		1st week		2nd week	
	C	E	C	E	C	E	C	E	C	E	C	E
Difference infur and skin	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Eyes and mucous membranes changes	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Respiratory abnormalities	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
Colour of the faeces	Nrm	Nrm	Nrm	Nrm	Nrm	Nrm	Nrm	Nrm	Nrm	Nrm	Nrm	Nrm
Salivation	Nrm	Nrm	Nrm	Nrm	Nrm	Nrm	Nrm	Nrm	Nrm	Nrm	Nrm	Nrm
Sleep	Nrm	Nrm	Nrm	Nrm	Nrm	Nrm	Nrm	Nrm	Nrm	Nrm	Nrm	Nrm
Coma	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
Convulsions	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Tremors	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Diarrhoea	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
Morbidity	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Mortality	0/6	0/6	0/6	0/6	0/6	0/6	0/6	0/6	0/6	0/6	0/6	0/6

Note: C: Control Group, E: AESP (2000 mg/kg) Treated Group, NE: No Effect, NO: Not Observed, NP: Not Present, Nrm: Normal

Journal of Chemical Health Risks

www.jchr.org

JCHR (2025) 15(3), 1528-1537 | ISSN:2251-6727

Table 3: Effect of AESP on Body Weight of Rats in Acute Toxicity Study

Groups	Treatment	Body Weight (gms)		
		0 day	7th day	14th day
Group 1	NC	156.667±2.185	161.167±2.023	164.667±2.362
Group II	TG	158.667±1.819$^{x(ns)}$	162.333±1.819$^{y(ns)}$	168.833±2.242$^{z(ns)}$

Note: Values are expressed as Mean±SEM of body weight of wistar rats (n=6): the data represents; $^{x, y, z(ns)}$p>0.05, when negative control compared with AESP 2000 mg/kg treated groups on day 0th, day 7th, day 14th respectively.

Table 4: Effect of AESP on Food Consumption of Rats in Acute Toxicity Study

Groups	Treatment	Food Intake (gms)		
		0thday	7thday	14thday
Group I	Normal (n=6)	87.4 gm	91 gm	92.7 gm
Group II	ASEP2000 (n=6)	88.9 gm	91.2 gm	92.5 gm

Table 5: Effect of AESP on Water Intake of Rats in Acute Toxicity Study

Groups	Treatment	Water Intake (ml)		
		0thday	7th day	14thday
Group 1	Normal (n=6)	210.4 ml	213.3 ml	216 ml
Group II	AESP 2000 (n=6)	208.5 ml	212 ml	214.8 ml

Serum Biochemical Estimation:

The biochemical analysis indicated that administering 2000 mg/kg body weight of aqueous seed extract of Spondias pinnata (AESP) did not significantly affect the experimental animals. Although there was a minor decline in SGPT, SGOT, BUN, and SCr levels, and a slight rise in ALP, TG, and LDL levels in the AESP-treated group compared to the control group, these differences were statistically insignificant (P > 0.05). The detailed serum biochemical parameters were presented in Table 6.

Table 6: Effect of AESP on Serum Biochemical Parameters of Rats in Acute Toxicity Study

Tests	Units	Sex	NC	AESP 2000
BUN	mg/dL	F (n=6)	18.216±0.744	16.88±0.975 $^{b(ns)}$
SCr	mg/dL	F (n=6)	0.458±0.0343	0.376±0.043 $^{b(ns)}$
SK	meq/L	F (n=6)	5.6±0.265	4.793±0.207 $^{b(ns)}$
SNa	meq/L	F (n=6)	149.433±1.364	146.773±3.075 $^{b(ns)}$
SCa	mg/dL	F (n=6)	8.14±0.2622	7.748±0.161 $^{b(ns)}$
SP	mg/dL	F (n=6)	5.713±0.3577	4.693±0.374 $^{b(ns)}$
TB	mg/dL	F (n=6)	0.625±0.0267	0.56±0.038 $^{b(ns)}$
TP	g/dL	F (n=6)	6.566±0.369	6.03±0.277 $^{b(ns)}$
Alb	g/dL	F (n=6)	3.636±0.157	3.2116±0.146 $^{b(ns)}$
SGOT / AST	IU/L	F (n=6)	83.02±4.949	85.226±5.612 $^{b(ns)}$
SGPT / ALT	IU/L	F (n=6)	60.536±5.839	63.115±3.064 $^{b(ns)}$
TC	mg/dL	F (n=6)	79.351±3.742	77.756±4.722 $^{b(ns)}$
TG	mg/dL	F (n=6)	43.441±5.008	46.055±5.611 $^{b(ns)}$
HDL	mg/dL	F (n=6)	52.0083±4.103	54.608±2.418 $^{b(ns)}$
LDL	mg/dL	F (n=6)	20.165±1.614	19.402±2.400 $^{b(ns)}$
VLDL	mg/dL	F (n=6)	8.446±0.843	7.781±0.507 $^{b(ns)}$
FBS	mg/dL	F (n=6)	93.361±2.441	91.698±2.509 $^{b(ns)}$
ALP	IU/L	F (n=6)	62.501±0.722	65.771±0.718 $^{b(ns)}$

Note: All values were expressed as mean value±SEM of six rats (n=6). The data represents $^{b(ns)}$p>0.05, when compared the values of BUN, SCr, SK, SNa, SCa, SP, TB, TP, Alb, SGOT/AST, SGPT/ALT, ALP, TC, TG, HDL, LDL, VLDL, FBS of negative control to AESP 2000 mg/kg treated groups respectively.

Journal of Chemical Health Risks

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JCHR (2025) 15(3), 1528-1537 | ISSN:2251-6727

Haematological Estimation:

The study evaluated hematological parameters in animals treated with AESP at 2,000 mg/kg and compared them to a normal control group on day 15 (Table 7). The results showed a slight increase in neutrophil and lymphocyte percentages in the AESP-treated group, while other values like Hb, PC, MCV, TLC, MCH, RBC count, and MCHC slightly decreased. However, all parameters remained within normal ranges, and the ANOVA test indicated no significant differences between the groups ($P > 0.05$).

Table 7: Effect of AESP on Haematological Parameters in Acute Toxicity Study

Parameters	Units	Sex	NC	AESP 2000
Hb	g/dL	F (n=6)	15.435±0.356	14.496±0.538 $^{a(ns)}$
% N	%	F (n=6)	27.673±0.975	28.578±1.853 $^{a(ns)}$
% L	%	F (n=6)	66.223±1.253	68.778±1.276 $^{a(ns)}$
% M	%	F (n=6)	6.5367±0.22	6.39±0.218 $^{a(ns)}$
% E	%	F (n=6)	1.523±0.287	1.376±0.205 $^{a(ns)}$
% B	%	F (n=6)	0.345±0.064	0.321±0.0414 $^{a(ns)}$
MCV	fL	F (n=6)	55.51±0.975	54.403±1 $^{a(ns)}$
MCH	pg	F (n=6)	20.931±0.723	20.041±0.833 $^{a(ns)}$
MCHC	g/dL	F (n=6)	37.048±0.546	36.071±0.718 $^{a(ns)}$
PC	10^3 /mm^3	F (n=6)	420.833±12.471	434.09±29.079 $^{a(ns)}$
RBC	10^6 /mm^3	F (n=6)	7.241±0.3065	6.123±0.395 $^{a(ns)}$
WBC	10^3 /mm^3	F (n=6)	3.033±0.195	2.556±0.196 $^{a(ns)}$

Histopathological Findings:

On the fifteenth day of the acute study period, a histopathological examination was conducted on the liver, spleen, kidney, stomach, heart, and ovary of animals from both the control group and those treated with AESP at 2000 mg/kg. The results, illustrated in the figures below, revealed no noticeable differences in the histopathology of these organs between the AESP-treated and control groups.

Histopathology of Liver:

A: The liver photomicrograph from the normal control group shows healthy liver cells (arrow), including the portal triad (arrowhead), sinusoids, and central vein, with no structural changes or necrosis. The hepatocytes, Kupffer cells, and endothelial cells all appear normal. The image was taken at 100X magnification using H&E staining.

B: Photomicrograph of liver of AESP treated group showed the arrangement of hepatocytes and lobular architecture was normal. Trabecular polygonal hepatocytes with abundant cytoplasm having round to oval nucleus, few lymphocytic infiltrates and mild activation of Kupffer cells around the central Vein, in the portal tract and parenchyma. No necrosis, fibrosis was found. (H&E staining, 100X).

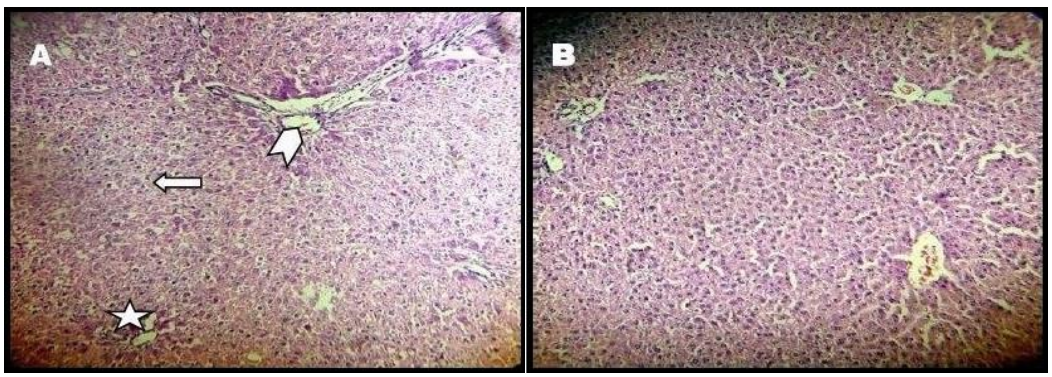

Figure 1: Photomicrograph of Liver of NC (A) and AESP (2000mg/kg) treated (B)Groups of Rats for Acute Toxicity Study

Journal of Chemical Health Risks

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JCHR (2025) 15(3), 1528-1537 | ISSN:2251-6727

Histopathology of Kidney:

C: Photomicrograph of kidney of normal control group showed cortex and medulla. Cortex showed numerous normal glomeruli having normal capillary loops and tubules. Glomerulus (arrow) were normal with round shape and solid structure. No area of ischemia or necrosis were seen (H&E, 100X).

D: Photomicrograph of kidney of AESP treated group showed cortex and medulla with no changes in cellular architecture. Cortex showed numerous glomeruli having normal capillary loops and interstitium. No area of ischemia, necrosis, no congestion of glomerular tuft was seen (H&E, 100X).

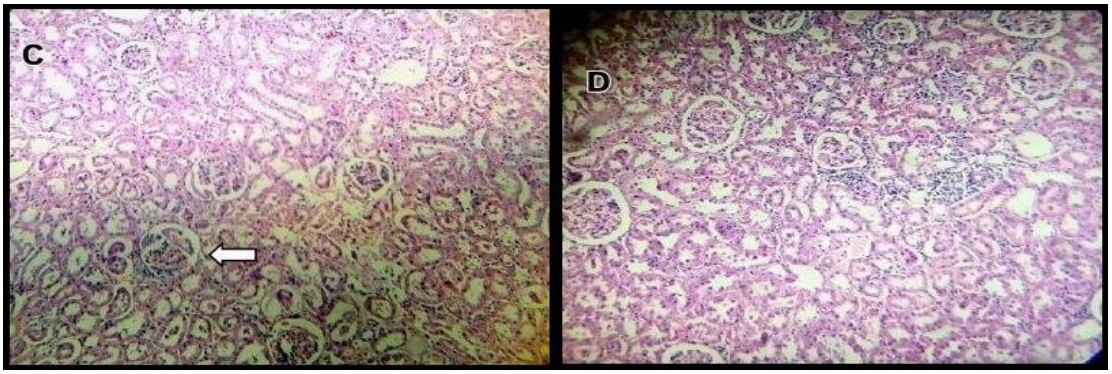

Figure 2: Photomicrograph of Kidney of NC (C) and AESP (2000mg/kg) treated (D) Groups of Rats for Acute Toxicity Study

Histopathology of Spleen:

E: Photomicrograph of spleen of normal control group showed red pulp (arrow) and white pulp (arrowhead) and lymphocytes surrounding a central arteriole (star). Normal splenic architecture in splenic parenchyma was observed with normal lymphoid f follicles and sinuses. (H&E, 100X).

F: Photomicrograph of spleen of AESP treated group showed red pulp and white pulp (lymphocytes) surrounding the central arteriole. Normal splenic architecture in splenic parenchyma was observed with normal lymphoid follicles and sinuses same as control. (H&E, 100X).

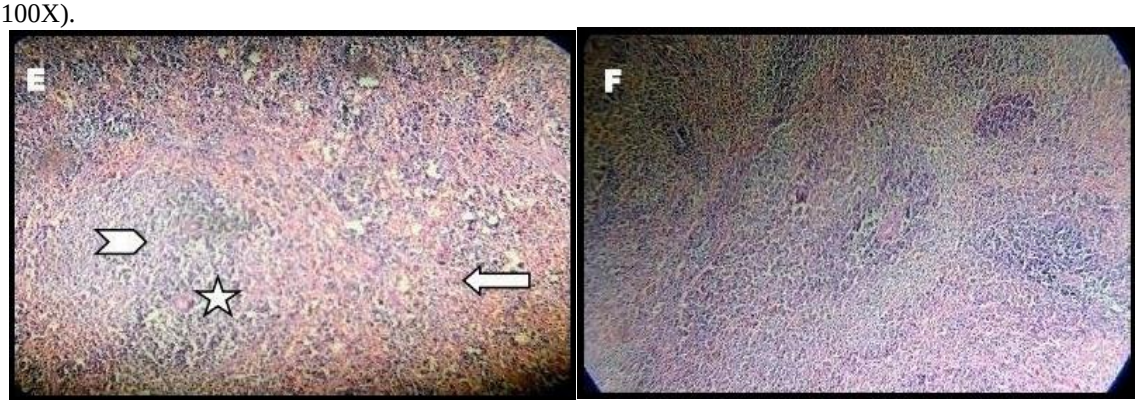

Figure 3: Photomicrograph of Spleen of NC (C) and AESP (2000mg/kg) treated (D) Groups of Rats for Acute Toxicity Study

Histopathology of Stomach:

G: Photomicrograph of gastric mucosa of stomach of normal control group animals showed normal architecture with intact mucosal epithelium with organized glandular structure. (H&E, 100X).

H: Section examined from gastric mucosa of rat stomach showing normal architecture with intact mucosal epithelium with organized glandular structure same as control. (H&E, 100X).

Journal of Chemical Health Risks

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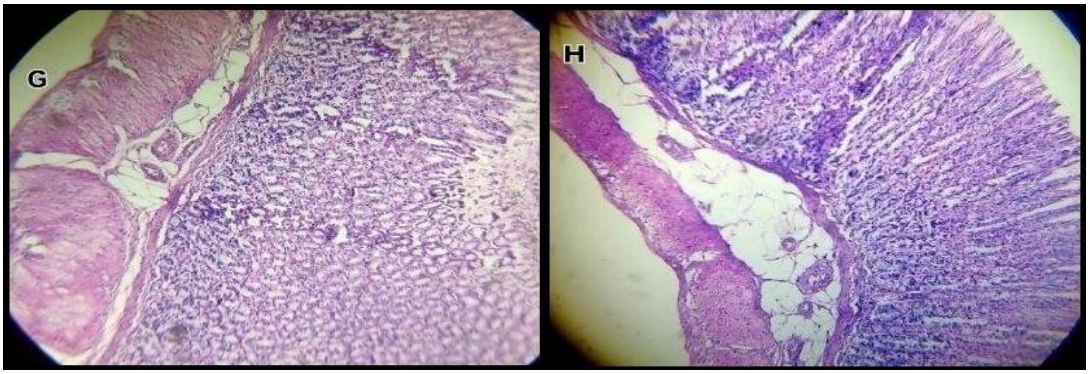

Figure 4: Photomicrograph of Stomach of NC (C) and AESP (2000mg/kg) treated (D) Groups of Rats for Acute Toxicity Study

Histopathology of Ovary:

I: Section from the rat ovary of normal control group animals showed normal ovarian histoarchitecture with several follicles. The primordial follicle contains primary oocyte surrounded by follicular cells. (H&E, 100X).

J: Photomicrograph from the rat ovary of AESP treated group showed normal ovarian architecture with several follicles in the histology, same as control group (H&E, 100X).

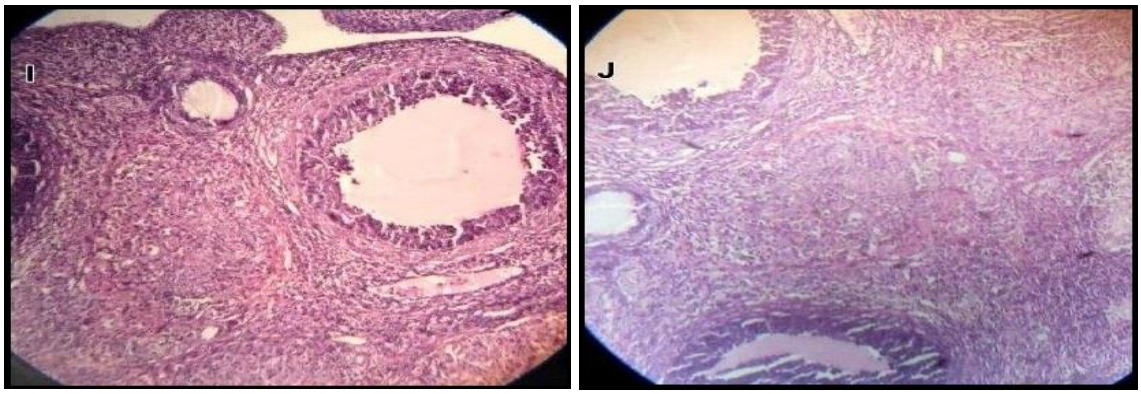

Figure 5: Photomicrograph of Ovary of NC (C) and AESP (2000mg/kg) treated (D) Groups of Rats for Acute Toxicity Study

Histopathology of Heart:

K: Section examined from rat heart of normal control group animals showed normally arranged and maintained polarity of myocytes (arrow) arranged in muscle bundles. No necrosis, disarray seen. (H&E, 100X).

L: Section examined from AESP treated rat heart showed regular and well-oriented myocardial fibers. No vacuolation, necrosis or hypertrophy was observed (H&E, 100X).

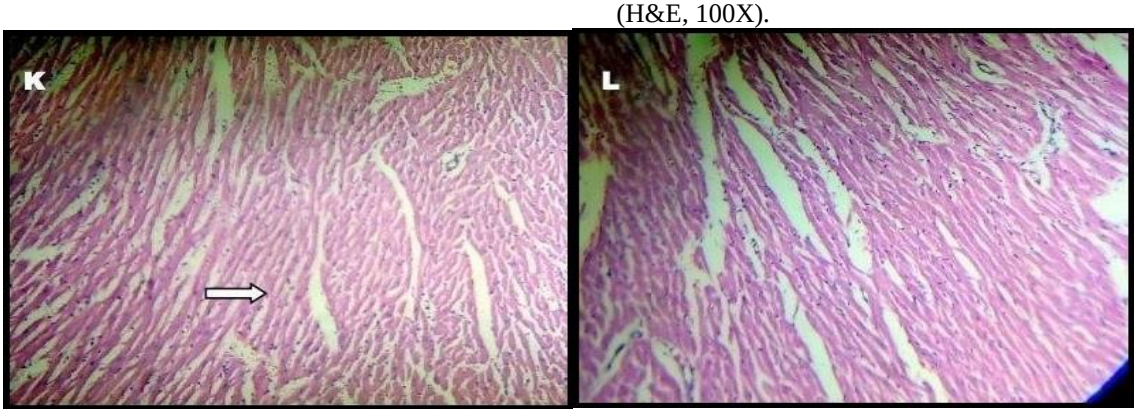

Figure 6: Photomicrograph of Heart of NC (C) and AESP (2000mg/kg) treated (D) Groups of Rats for Acute Toxicity Study

Journal of Chemical Health Risks

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JCHR (2025) 15(3), 1528-1537 | ISSN:2251-6727

4. DISCUSSION:

The findings of the present research work provide a comprehensive toxicological profile of *Spondias pinnata* aqueous seed extract (AESP), demonstrating its safety in Wistar rats. An acute toxicity study was conducted with a dose of 2000 mg/kg body weight (bw.) administered orally to rats. Throughout the 14-day observation period, no signs of distress, toxicity, or fatalities were observed. There were no significant changes in the animals' skin, eyes, fur, mucous membranes, or behavior. Additionally, body weight remained stable, with no significant loss, and food and water intake were comparable to control groups. The absence of significant toxicity in acute studies supports its traditional use in herbal medicine. The high safety margin observed in the acute toxicity study, with no mortality or adverse effects at a dose of 2000 mg/kg, suggests that the extract is safe for short-term exposure.

Haematological, liver, kidney, and lipid profiles of treated groups showed no statistically significant differences from controls, indicating no impact on metabolic activity or organ function. Histopathological examination revealed no signs of tissue damage in vital organs. The minor inflammatory changes observed in the liver during histopathological examination were not considered toxicologically relevant, as similar changes were observed in the control group. These findings indicate that the aqueous extract of *Spondias pinnata* seeds does not pose significant risks to vital organs under the conditions tested.

However, it is important to note that while the findings of this study are promising, further research is required to fully establish the safety of *Spondias pinnata* seed extract. Long-term toxicity studies, including subacute toxicity, chronic toxicity, carcinogenicity, and reproductive toxicity assessments, are recommended to provide a more comprehensive safety profile. Additionally, studies exploring the pharmacokinetics and mechanism of action of the extract will be valuable in understanding its therapeutic potential and safety in human populations.

5. CONCLUSION:

The toxicological assessment of *Spondias pinnata* aqueous seed extract (AESP) in Wistar rats indicates a high safety margin for acute exposure. AESP at 2000 mg/kg b.w. is non-toxic and safe for consumption. The findings support the traditional medicinal use of *Spondias pinnata* seeds and suggest that the aqueous extract is relatively safe for further pharmacological and clinical evaluations. However, long-term studies are necessary to fully establish its safety profile.

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REFERENCES:

1. Stahlmann R, Horvath A. Risks, risk assessment and risk competence in toxicology. Ger Med Sci. 2015 Jul 9; 13: Doc09. doi: 10.3205/000213. PMID: 26195922; PMCID: PMC4507061.
2. Parasuraman S. Toxicological screening. J Pharmacol Pharmacother. 2011 Apr; 2(2): 74-9. doi: 10.4103/0976-500X.81895. PMID: 21772764; PMCID: PMC3127354.
3. Borgert CJ, Fuentes C, Burgoon LD. Principles of dose-setting in toxicology studies: the importance of kinetics for ensuring human safety. Arch Toxicol. 2021 Dec; 95(12): 3651-3664. doi: 10.1007/s00204-021-03155-4. Epub 2021 Oct 8. PMID: 34623454; PMCID: PMC8536606.
4. Gautam D.N.S. Physicochemical and Acute Toxicity Study of Gunja (Abrus precatorius) Pericarp. Research Journal of Pharmacy and Technology. 2018; 11(5): 1935-1939. doi: 10.5958/0974-360X.2018.00359.1
5. Mukhi S, Bose A, Das D.K, Panda S.K, Mohapatra D, Latha S, Balaraman A.K. Acute and Sub-acute Toxicity study of Amrtadi Churna. Research Journal of Pharmacy and Technology. 2021; 14(6): 3111-8. doi: 10.52711/0974-360X.2021.00543
6. Mondal S, Bhar K, Panigrahi N, Mondal P, Nayak S, Barik RP, Aravind K. A Tangy Twist Review on Hog-Plum: Spondias pinnata (L. f.) Kurz. Journal of Natural Remedies. 2021 Feb. 26; 21(1):1-25.
7. Rymbai H, Deshmukh N, Jha A.K, Verma V, War F, Paul D, Patel R, Roy A. Indian Hog Plum (Spondias pinnata (L. f.) Kurz. Breeding of Underutilized Fruit Crops. 2016; 183-189.
8. Santos E.M.D, Ataide J.A, Coco J.C, Fava A.L.M, Silverio L.A.L, Sueiro A.C, Silva J.R.A, Lopes A.M, Paiva-Santos A.C, Mazzola P.G. *Spondias* sp: Shedding Light on Its Vast Pharmaceutical Potential. Molecules. 2023 Feb 16; 28(4): 1862. doi: 10.3390/molecules28041862. PMID: 36838849; PMCID: PMC9963416.
9. Attanayake A, Jayatilaka K.A.P.W, Pathirana C, Mudduwa L.K.B. Phytochemical screening and In vitro antioxidant potentials of extracts of ten medicinal plants used for the treatment of diabetes mellitus in Sri Lanka. African Journal of Traditional, Complementary and Alternative Medicines. 2015; 12(4): 28-33.
10. Chaudhary P, Sharma R, Rupanar S, Jadhav S, Bongade A, Shinde P, Gavit S. Preparation and

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JCHR (2025) 15(3), 1528-1537 | ISSN:2251-6727

Evaluation of Herbal Mouthwash Containing Hydroalcoholic Extract of Pongamia pinnata. Asian Journal of Biological and Life Sciences. 2023 Jan; 12(1): 172-178.

11. Khandelwal K. Practical pharmacognosy. Pragati Books Pvt. Ltd.; 2008 Sep 7.
12. Kokate C.K. Practical Pharmacognosy. Vallabh Prakashan; 4th ed. New Delhi, India: 1994. pp. 112–20.
13. Jabbar A, Ilyas Y.M, Hamzah H, Raharjeng A.R.P, Sari R, Handayani T.T, Pratiwi S.U.T. Acute Toxicity Test of Zebrafish, Antifungal and Antibiofilm Activity of Etlingera rubroloba A.D Poulsen against Candida albicans. Research Journal of Pharmacy and Technology. 2024; 17(8): 3613-9. doi: 10.52711/0974-360X.2024.00564
14. Chinedu E, Arome D, Ameh FS. A new method for determining acute toxicity in animal models. Toxicol Int. 2013 Sep;20(3):224-6. doi: 10.4103/0971-6580.121674. PMID: 24403732; PMCID: PMC3877490.
15. Erhirhie E.O, Ihekwereme C.P, Ilodigwe E.E. Advances in acute toxicity testing: strengths, weaknesses and regulatory acceptance. Interdiscip Toxicol. 2018 May; 11(1): 5-12. doi: 10.2478/intox-2018-0001. Epub 2018 Aug 6. PMID: 30181707; PMCID: PMC6117820.
16. OCDE. OECD guideline for testing of chemicals: OECD 423; 2001. p. 1–14.
17. Ekanayake C.P, Thammitiyagodage M, Padumadasa S, Seneviratne B, Chayanika P, Abeysekera A. Acute and Subacute Toxicity Studies of the Ethyl Acetate Soluble Proanthocyanidins of the Immature Inflorescence of Cocos nucifera L. in Female Wistar Rats. BioMed Research International. 2019; Vol. 2019, Article ID 8428304: 1-12. doi: 10.1155/2019/8428304