

A Comprehensive Study on *Achyranthes aspera* and *Aesculus indica* Hepatoprotective and Nephroprotective Activities of against Cisplatin Induced Rodent Model

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ABSTRACT

Aim: In our present research, we aimed to evaluate the protective effects of HF1, HF2, and HF3 against liver and kidney damage induced by Cisplatin in Sprague Dawley rats. The ethanol fraction of the plant underwent initial phytochemical analysis followed by subsequent *in vivo* screenings. The findings from the phytochemical investigation indicated that HF2 demonstrated a more potent hepatoprotective and renal protective activity. **Background:** Anti-cancer medications have the potential to inflict harm on the liver and kidneys, underscoring the crucial need for hepatoprotection in safeguarding liver function. Among the elderly population, liver and kidney impairment account for 10% of chronic hepatitis and renal failure cases. The decline induced by anti-cancer drugs has not been thoroughly assessed, partly due to its underestimation in clinical practice and challenges in making a precise diagnosis. While chemotherapeutic agents can induce liver toxicity through various mechanisms and lead to different types of liver and kidney injuries, they share the common trait of being both hepatotoxic and nephrotoxic. **Materials and Methods:** The dried peels of *Aesculus indica* fruits and powdered leaves of *Achyranthes aspera* were subjected to Soxhlet extraction using 95% ethanol. Rat will randomly into five groups (six rats per each group). cisplatin group will give a single injection of cisplatin (20 mg per Kg, i.p) on the first 1st, 7th, 14th, 21th and 28th days. Hepatic function was assessed by measuring blood bilirubin, Glutamate Oxaloacetate Transferase (SGOT), and Glutamate Pyruvate Transaminase (SGPT). Blood tests were used to check the function of the liver and kidneys. **Results:** These results collectively suggest that HF1, HF2, and HF3 serve as a potential reservoir of novel secondary metabolites. Moreover, this study has laid the groundwork for future research in pharmacological studies, particularly in the development of potent biomedicine for the treatment of various chronic diseases. **Conclusion:** The current study has also proved the way for future pharmacological investigations, particularly with regard to all medications derived from the creation of powerful medicines for the management of various chronic conditions.

Keywords: Cisplatin, Hepatoprotective, Nephroprotective, Herbal formulation.

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Received: 27-10-2023;

Revised: 12-01-2024;

Accepted: 27-02-2024.

INTRODUCTION

Liver and kidney are the vital major organ of the human body, its play various important roles like metabolism, distribution, detoxification, productions various hormones, homeostasis, protein synthesis, as well as kidney excrete various toxicants such as urea, nitrogen, uric acid, creatinine, maintain our body fluids, hormones secretion, maintain electrolytes balance and purifying in our blood.^[1] Accounting for approximately liver 1.2-1.5 kg and kidney 72-235 g of average body weight.^[2] Liver and kidney both organs are located in our upperpart of the abdominal cavity. Now days some drugs and toxicants are showing major adverse effects

and injured vital organs such as brain, liver, kidney develop hepatic fibrosis and nephrotic fibrosis. The most common cause of acute liver failure and kidney failure in India and around the world is drug-induced liver and kidney damage.^[3] Approximately 10% of human patients today will pass away or need a liver and kidney transplant.^[4] Anticancer medications such cisplatin, methotrexate, sorafenib, dactinomycin, iodamide, gemcitabine, etoposide, irinotecan, procarbazine, 6 mercaptopurine, cytarabine, crizotinib, and cyclophosphamide are the ones most commonly exhibiting negative side effects.^[5] Cisplatin (Cisdiammine Dichloro Platinum II, CDDP) is a commonly used platinum-based anti-cancer drug for the treatment of bladder, cervical, testicular, ovarian, breast, and other malignancies. Although its use for treatment is typically fairly restricted due to its negative side effects. Cisplatin mostly results in acute kidney damage and liver fibrosis.^[6] Hepatotoxicity and nephrotoxicity



DOI: 10.5530/pres.16.2.40

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are typical adverse effects of, *Tinospora cordifolia*, *Trigonella foenum*, *Phyllanthus emblica*, *Annona squamosa* etc.^[7]

Achyranthes aspera is a commonly known coarse straw found in Asian countries India, China, Bangladesh and Pakistan that belongs to Amaranthaceae family.^[8] The *Achyranthes aspera* is used as traditional medicine such as inflammation, diabetes, skin disorder, snake bites etc.^[9] The plant has present alkaloids, flavonoids, tannis, glycosides, steroids, saponins, terpenoids etc. Till date, no scientific studies were done on its hematopoietic and nephrotoxic active of extract of *Achyranthes aspera* leaves.^[10]

Figure 1 *Aesculus indica* has not been evaluated in depth for its pharmacological properties inspect of its tradition use in numerous medical conditions. These plants belong to soapberry family. *Aesculus indica* found in mountain region India, Pakistan, Nepal, Bhutan and Tibet. It is locally known Indian horse chestnut, has been used in folk medicine for its multifarious medicinal properties.^[11] Figure 2 its leaves used in anti-cancer, skin disorder, relief of headaches and also in narcotic. The present studies were designed to investigate the hepatoprotective and nephroprotective activity of ethanol extract of *Achyranthes aspera* (leaves) and *Aesculus indica* (dried fruit peals), toxicity cause by cisplatin in experimental animals.^[12]

MATERIALS AND METHODS

Plant material

The dry fruit peals of *Aesculus indica* were obtained from Kashmir, India, and validated by a specialist in the plant taxonomy department of the Government College Khimlasa, Sagar (M.P.). The fresh leaves of *Achyranthes aspera* were taken from the medicinal garden at ITM University. For extraction purposes, the leaves and fruit dry peals were shade-dried and ground into a coarse powder.



Figure 1: *Achyranthes aspera*.

Extract preparation

The dried peels of *Aesculus indica* fruits and powdered leaves of *Achyranthes aspera* were subjected to Soxhlet extraction using 95% ethanol. The hot extract was filtered and then subjected to reduced-pressure vacuum distillation to completely eliminate the solvent, followed by drying in a desiccator. Subsequently, an ethanol extract of the leaves was preserved in an airtight container for future research purposes.

Herbal formulation

Animals

Hepatoprotective and nephroprotective was carried out on *Sprague-dawley* rats either sex, from SKPCPER, Animal house facility, Ganpat University Mehsana, (Gujarat) India. All Sprague-Dawley rats were 150 g to 220 g in weight and in good health. With the help of standard laboratory food and clean water, the temperature was controlled at 25^oC while the animals were housed in air conditioning. Every third day, the animals' bedding was changed. The CCSEA ethics committee gave the study their approval, and all experimental procedures closely adhered to IAEC standards. Establishment number: SKPCPER/IAEC/2022-01/02.

Methods

Rat will randomly into five groups (six rats per each group).

- Group-1:** control group received normal saline until termination of the experiment.
- Group-2:** cisplatin group will give a single injection of cisplatin (20 mg per Kg, i.p) on the first 1st, 7th, 14th, 21th and 28th days.
- Group-3:** received HF-1 once daily for 28th consecutive days and single injection of cisplatin (20 mg per Kg, i.p.) on the first 1st, 7th, 14th, 21th and 28th days.
- Group-4:** received HF-2 once's daily for 28th consecutive days and single injection of cisplatin (20 mg per Kg, i.p.) on the first 1st, 7th, 14th, 21th and 28th days.
- Group-5:** received HF-3 once's daily for 28th consecutive days and single injection of cisplatin (20 mg per Kg, i.p.) on the first 1st, 7th, 14th, 21th and 28th days.

Biochemical parameters

Hepatic function was assessed by measuring blood bilirubin, Glutamate Oxaloacetate Transferase (SGOT), and Glutamate Pyruvate Transaminase (SGPT). Blood tests were used to check the function of the liver and kidneys. The amounts of urea, creatinine, uric acid, and total protein in the blood were used to evaluate kidney function.^[13,14]

Statistical analysis

The Mean SEM for each group was used to represent the results. After doing a one-way Analysis of Variance (ANOVA), Dunnett's *t*-test was used to assess statistical differences. At $p < 0.05$, the results were deemed statistically significant.

RESULTS

In present study various endophytic fractions from *Achyranthes aspera* and dry fruits peels of *Aesculus indica*. Wares subjected for phytochemical and pharmacological investigations and also study protective effect from *Achyranthes aspera* and dry fruits peels of *Aesculus indica*. The present study revealed the following data.



Figure 2: *Aesculus indica*.

Phytochemical investigation

Preparation of fraction properties

The crude fractions AAF-1, AAF-2, AAF-3 and AAF-6 and AIF-1, AIF-2, AIF-3, and AIF-6 were obtained by flash rotary evaporation process with solvent ethyl alcohol. The % yield were found to be 0.8-1.5% for AAF-1, 0.9-1.5% for AAF-2, 0.9-1.3% for AAF-3 and 0.7-1.6% for AAF-6. AIF-1 .0.1-1.9%, AIF-2 1.0.9-1.6, AIF-3 0.6-1.4 and AIF-6 .0.9-1.6 are respectively.

Preliminary phytochemical screening

The qualitative chemical investigation of ethyl acetate endophytic from *Achyranthes aspera* and dry fruits peels of *Aesculus indica*. Was carried out to find the presence of various chemical

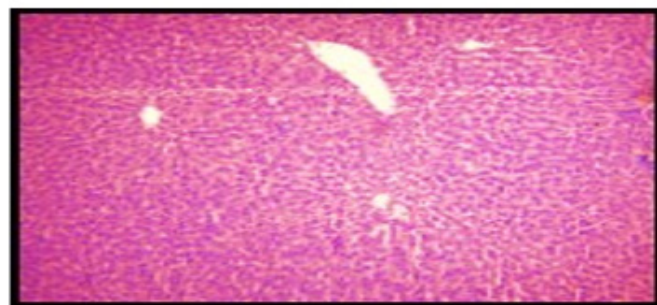


Figure 3: Normal Control.

Table 1: Impact of Diets Enriched with Herbal Formulation (HF) on Liver Function Parameters in Cisplatin-Treated Animals.

Treatment	SGOT (AST) (U/L)	SGPT (ALT) (U/L)	ALP (U/L)	ACP (U/L)	Bilirubin (mg/100 mL of blood)	
					Direct (mg/dL)	Total (mg/dL)
Normal rats	74.343.46	78.426.27	125.822.71	131.284.82	0.240.42	0.520.13
Control rats (Cisplatin 20 mg/kg)	183.115.70*	203.753.27*	234.526.58*	218.407.35*	1.070.11*	3.510.27*
HF1+ Cisplatin (20 mg/kg)	81.413.47 ^a	78.616.41 ^a	126.74.90 ^a	135.545.20 ^a	0.310.35 ^a	0.530.41 ^a
HF2+Cisplatin (20 mg/kg)	92.142.54 ^a	86.124.46 ^a	136.313.27 ^a	142.842.48 ^a	0.300.56 ^a	0.570.26 ^a
HF3+Cisplatin (20 mg/kg)	76.365.74 ^a	81.243.34 ^a	115.755.16 ^a	126.554.63 ^a	0.310.26 ^a	0.480.27 ^a

The data is presented as mean±SEM, with six samples in each group. *Statistical significance was observed at $p < 0.05$ when compared to the control group, and 'a' indicates significance at $p < 0.05$ when compared to the cisplatin treated group.

constituents and the results are given in Table 8. It observed that flavonoids, glycosides, protein, terpenoids and tannins were present in the both fraction (AAF, AIF).^[15-19]

Results of Qualitative Chemical Tests

Evaluation of hepatoprotective and nephroprotective activity

Hepatoprotective effect of extract in a cisplatin-induced hepatotoxicity model, the hepatoprotective efficacy of HF1, HF2, and HF3 body weight was assessed. The cisplatin-treated

rats extensively damaged their livers, as evidenced by changes in the activity of the serum enzymes SGOT, SGPT, ALP, ACP, and total bilirubin in serum (Table 1). When compared to the normal control group, the SGOT, SGPT, ALP, ACP, and total bilirubin values in the cisplatin-treated rats were substantially higher ($p < 0.05$ showing that ethanol has great protective activity against cisplatin-induced liver damage).

The study's findings demonstrated that rats given cisplatin had severe liver damage, as shown by a substantial rise in the liver

Table 2: Effect of herbal formulation on oxidative stress induced by cisplatin in the liver of experimental animals.

Treatment	Enzymes involved in oxidative stress in liver			
	LPO (Mole/g)	SOD (U/g)	GSH (μ Mole/g)	Catalase (U/mg)
Normal rats	63.11 \pm 1.28	57.27 \pm 3.73	3.53 \pm 0.83	7.94 \pm 0.51
Control rats+cisplatin (20 mg/kg)	142.61 \pm 3.65*	10.54 \pm 4.12*	0.46 \pm 0.47*	1.19 \pm 0.81*
HF1+cisplatin (20 mg/kg)	66.25 \pm 2.18 ^a	62.75 \pm 2.68 ^a	3.18 \pm 0.63 ^a	6.28 \pm 0.43 ^a
HF2+cisplatin (20 mg/kg)	68.12 \pm 4.24 ^a	52.96 \pm 3.52 ^a	3.17 \pm 0.67 ^a	6.20 \pm 0.19 ^a
HF3+cisplatin (20 mg/kg)	65.25 \pm 3.36 ^a	59.85 \pm 2.17 ^a	3.25 \pm 0.94 ^a	6.52 \pm 0.27 ^a

Data is presented as mean \pm SEM, with a sample size of 6 in each group. *Significant at $p < 0.05$ compared to the control group, and considered statistically significant at $p < 0.05$ compared to the group treated with cisplatin.

HISTOPATHOLOGICAL STUDY

Liver

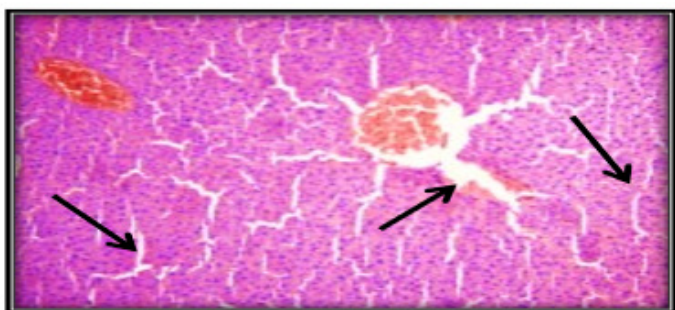


Figure 4: Disease control.

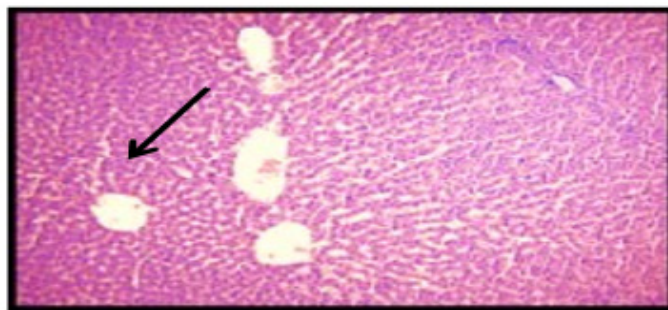


Figure 6: HF2+Cisplatin.

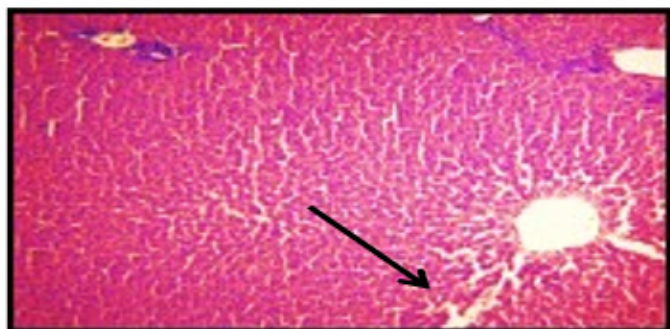


Figure 5: HF1+Cisplatin.

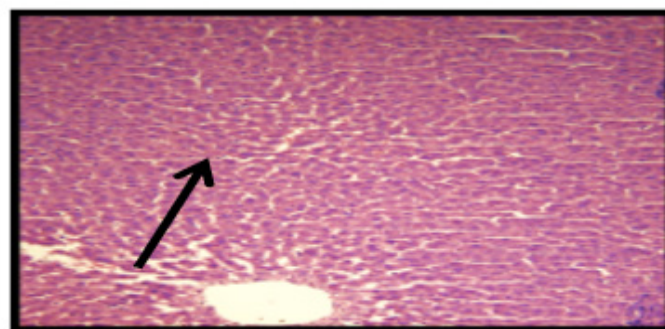


Figure 7: HF3+Cisplatin.

Kidney

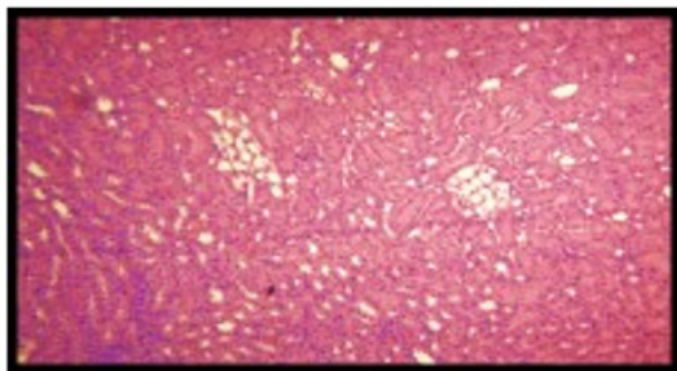


Figure 8: Normal Control.

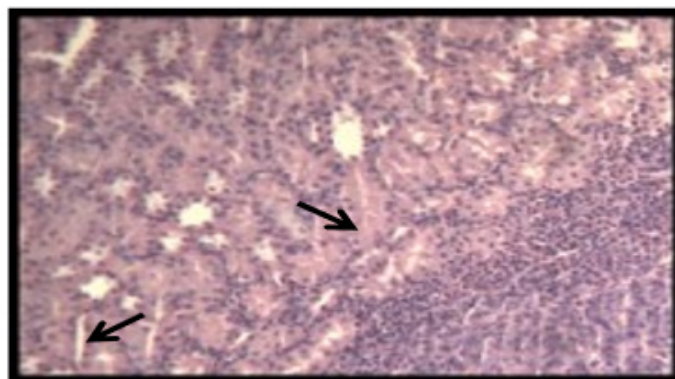


Figure 11: HF2+Cisplatin.

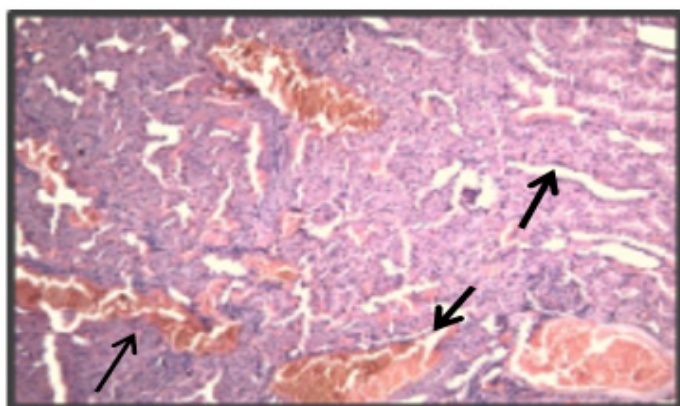


Figure 9: Disease control Cisplatin.

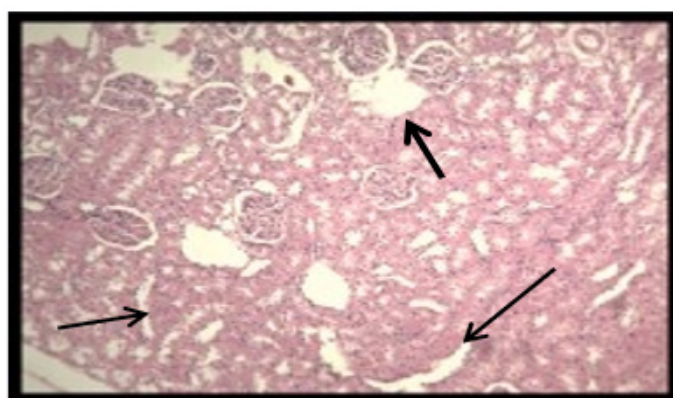


Figure 12: HF3+Cisplatin.

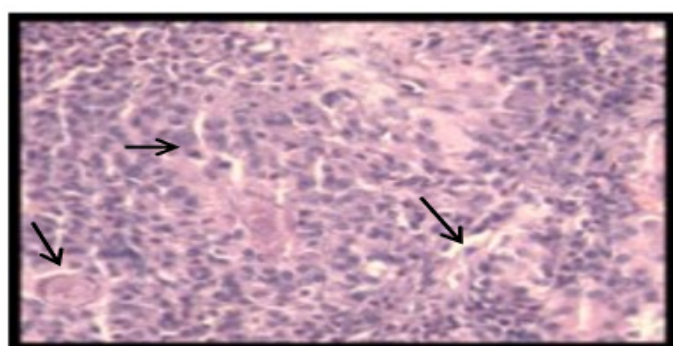


Figure 10: HF1+Cisplatin.

transaminases SGOT, SGPT, ALP, and ACP. The greatest sign of liver necrosis is these cytosolic enzymes. An increase in their serum activity denotes a cell membrane leak, which is linked to the demise of hepatocytes. These biochemical alterations were greatly attenuated by HF1, HF2, and HF3 ethanol extracts of *Achyranthes aspera* (leaves) and *Aesculus indica* (fruits peels), indicating that these plants are capable of successfully reversing the damage to liver cells caused by cisplatin.

Nephroprotective effect of extract in the levels of blood urea, creatinine, uric acid, total protein, and BUN were significantly higher in the cisplatin-treated groups of rats than in the control groups, indicating severe nephrotoxicity. When ethanol extracts of *Achyranthes aspera* (leaves) and *Aesculus indica* (fruit peels) were used instead of cisplatin, there was a significantly ($p < 0.05$) lower levels of blood urea, creatinine, uric acid, total protein, and BUN. It claimed that the ethanol extract of *Achyranthes aspera* (leaves) and *Aesculus indica* (fruits and peels) leaves have renal-protective effects (Table 2).

DISCUSSION

In our current study, we aimed to assess the protective effects of herbal formulations HF1, HF2, and HF3 Figure 8 against Cisplatin-Induce liver and kidney toxicity in Sprague Dawley rats. The ethanol fraction of the plant underwent initial phytochemical analysis and subsequent *in vitro* screenings. The results revealed a diverse range of phytoconstituents, including phenolic compounds, glycosides, flavonoids, tannins, and proteins (Tables 3 and 4). Subsequently, three active herbal formulations (HF1, HF2, and HF3) were prepared, and experimental rats treated with

Table 3: AAF (*Achyranthes aspera* Fraction).

Phytochemical Constituents	Ethanol fractions			
	AAF-1	AAF-2	AAF-3	AAF-6
Alkaloids	--	--	--	--
Carbohydrates	+	+	+	+
Flavonoids	++	++	+	++
Glycosides	++	+	+	+
Tannins	++	++	++	++
Steroids	--	--	--	--
Saponins	++	++	++	++
Triterpinoid	+	+	+	+
Protein	+	+	+	+

-absent ++clarity+Present++ better response.

Table 4: AIF *Aesculus indica* Fraction.

Phytochemical Constituents	Ethanol fractions			
	AIF-1	AIF-2	AIF-3	AIF-6
Alkaloids	+	+	+	+
Carbohydrates	-	-	-	-
Flavonoids	++	++	+	++
Glycosides	++	+	+	+
Tannins	+	+	+	+
Steroids	--	--	--	--
Saponins	++	++	++	++
Triterpinoid	+	+	+	+
Protein	+	+	+	+

-absent ++clarity+Present++ better response.

Table 5: Effect of herbal formulation on Kidney function test in animals treated with cisplatin.

Treatment	Urea (mg/dL)	Uric acid (mg/dL)	Creatinine (mg/dL)	BUN (mg/dL)	Total protein (gm/dL)
Normal rats	41.54±0.27	1.14±0.92	0.63±0.74	20.73±0.32	4.18±0.41
Control rats (cisplatin 20 mg/kg)	163.75±0.58*	8.44±0.63*	2.88±0.42*	110.34±0.59*	17.20±0.83*
HF1+cisplatin (20 mg/kg)	44.26±0.47 ^a	1.42±0.51 ^a	0.67±0.29 ^a	31.47±0.72 ^a	4.70±0.79 ^a
HF2+cisplatin (20 mg/kg)	50.32±0.35 ^a	1.74±0.29 ^a	0.73±0.18 ^a	36.85±0.48 ^a	5.03±0.28 ^a
HF3+cisplatin (20 mg/kg)	38.55±0.71 ^a	1.24±0.46 ^a	0.58±0.67 ^a	28.16±0.63 ^a	4.22±0.34 ^a

The data is presented as mean±SEM, with a sample size of 6 in each group. *Statistically significant at p<0.05 compared to the control group, and considered statistically significant at p<0.05 compared to the group treated with cisplatin.

Table 6: Effect of herbal formulation on Body weight, Urine volume, Urine pH and Kidney weight treated in rats.

Treatment	Body weight (gm)	Urine volume (mL)	Urine pH	Kidney weight (gm)
Normal rats	179.32±1.05	25.04±0.47	5.72±0.62	1.35±0.41
Control rats (cisplatin 20 mg/kg)	128.61±0.85*	10.72±0.24 ^a	9.32±0.41*	3.47±0.58*
HF1+cisplatin (20 mg/kg)	174.65±1.21 ^a	25.17±0.68 ^a	5.84±0.38 ^a	1.38±0.67 ^a
HF2+cisplatin (20 mg/kg)	172.39±1.36 ^a	23.67±0.25 ^a	5.91±0.57 ^a	1.43±0.97 ^a
HF3+cisplatin (20 mg/kg)	175.27±0.49 ^a	26.58±0.53 ^a	5.82±0.73 ^a	1.39±0.38 ^a

The data is presented as mean±SEM, with a sample size of 6 in each group. *Statistically significant at $p<0.05$ compared to the control group, and 'a' indicates statistical significance at $p<0.05$ compared to the cisplatin treated group.

Table 7: Determination of Lipid profile after treatment with herbal formulation.

Group	Lipid Profile (mg/dL)			
	Triglyceride	Total Cholesterol	HDL	LDL
Normal rats	72.18±1.85	79.29±4.21	65.35±2.87	40.21±3.14
Control rats cisplatin (20 mg/kg)	173.42±3.57 ^a	156.73±2.79 ^a	23.11±5.31 ^a	132.82±2.66 ^a
HF1+cisplatin (20 mg/kg)	79.14±2.43*	87.29±6.14*	64.38±4.29*	53.71±3.42*
HF2+cisplatin (20 mg/kg)	80.94±4.61*	89.63±3.38*	68.76±2.47*	52.86±6.13*
HF3+cisplatin (20 mg/kg)	75.32±3.73*	86.54±4.91*	66.47±3.22*	49.12±5.82*

The data is presented as mean ± SEM, with six samples in each group. *Statistical significance was observed at $p<0.05$ compared to the control group, and 'a' indicates significance at $p<0.05$ when compared to the cisplatin treated group.

Table 8: Haematological values of rats.

Observation	Normal	Control rats (cisplatin 20 mg/kg)	HF1+cisplatin (20 mg/kg)	HF2+cisplatin (20 mg/kg)	HF3+ isplatin (20 mg/kg)
WBC ($10^3/\mu\text{L}$)	11.23±0.69	19.51±0.54*	10.36±0.25 ^a	10.92±0.89 ^a	10.57±0.72 ^a
Hb (g/dL)	14.36±0.28	9.13±0.72*	13.48±0.69 ^a	13.73±0.24 ^a	13.63±0.58 ^a
RBC ($10^6/\mu\text{L}$)	8.53±0.47	3.65±0.61*	8.42±0.37 ^a	8.17±0.41 ^a	8.52±0.46 ^a

The results are presented as mean ± SEM, with six samples in each group. *Statistical significance was observed at $p<0.05$ when compared to the control group, and also at $p<0.05$ when compared to the group treated with cisplatin.

Cisplatin exhibited significant liver and kidney damage along with increased oxidative stress (Tables 8 and 9).

This damage was reflected in elevated levels of serum markers such as SGOT, SGPT, ALT, ALP, Total Bilirubin, Total Protein, Albumin, Globulin, Creatinine, and Blood Urea Nitrogen (BUN) (Tables 1 and 5). These biochemical alterations indicated cellular membrane leakage and a loss of cell membrane integrity in the liver and kidney. Histopathological examination confirmed substantial damage, resembling viral hepatitis and nephritis, caused by Cisplatin. The toxicity initiated with alterations in the endoplasmic reticulum, resulting in the loss of intracellular metabolic enzymes (Table 6).

The cytotoxic effects of Cisplatin led to the generation of free radicals, which further combined with oxygen to form trichloromethyl peroxy radicals. Cytochrome P450 enzymes were responsible for these conversions. These radicals covalently bound to macromolecules, causing oxidative degradation of lipid

Table 9: A-Indicate *Achyranthes aspera* plant seed extract; B-indicate *Aesculus indica* plant extract.

Formulations	Plant extracts (gm)	
	A	B
HF-1	40	40
HF-2	30	40
HF-3	40	30

membranes in adipose tissues. In line with this theory, treatment with HF1, HF2, and HF3 resulted in reduced levels of AST, ALT, ALP, and bilirubin, while stabilizing the plasma membrane and repairing hepatic tissue damage induced by Cisplatin. This outcome aligns with the widely accepted belief that the regeneration of hepatocytes and the repair of hepatic and renal parenchyma lead to a return of transaminase levels to normal.

According to the histological studies, Cisplatin injection led to the degradation of fatty acid cysts, lymphocyte infiltration,

Kuffer cell proliferation, and sinusoidal congestion in the liver. Elevated levels of ALP, Total Bilirubin, Total Protein, Albumin, Globulin, Creatinine, and Blood Urea Nitrogen were among the biochemical markers mitigated by the administration of HF1, HF2, and HF3. Similarly, histopathological observations (see Figure 3) indicated normalized hepatic globular architecture, reduced lymphatic infiltrations, and normalized Kuffer cell proliferation. These findings suggest that the administered drugs exhibited hepatoprotective and renoprotective activity against Cisplatin-induced hepatic and renal toxicity (Figures 5-8).

Furthermore, the initial phytochemical analysis of the herbal drugs revealed the presence of flavonoids and phenolic compounds, which are known to have hepatoprotective and renoprotective effects (Figures 4 and 9). It has been postulated that one of the primary causes of Cisplatin-induced liver and kidney injury is the formation of lipid peroxides by free radical derivative Lt4. The body possesses defense mechanisms to counteract and neutralize damages induced by free radicals. The weights of excised liver and kidney were recorded, showing a slight increase in the liver weights of the Cisplatin-treated group (Figures 10-12).

Hepatorenal toxicants like Methotrexate rely on metabolic activation, particularly by liver and kidney cytochrome P450 enzymes, to form reactive, toxic metabolites that lead to liver injury in experimental animals. It is well established that free radicals cause cell damage through mechanisms involving covalent binding and lipid peroxidation within associated tissues. All treatment drugs demonstrated notable antioxidant properties, thus safeguarding against oxidative damage to cells. The administration of HF1, HF2, and HF3 normalized both the biochemical and tissue abrasions induced by Cisplatin. In accordance with the results and conclusions drawn, it can be inferred that the hepatoprotective and renoprotective activity against this challenge is likely attributable to their free radical scavenging activity and prevention of lipid peroxidation (Table 7).

CONCLUSION

In rats with hepatic and renal damage brought on by cisplatin, the HF1, HF2, and HF3 exhibit strong antioxidant, hepatoprotective, and renal protective activities. The findings suggest that all medications' antioxidant properties may be to blame for their hepatoprotective and renal protective action, with HF1 being more effective than HF2 in this regard. More powerful HF2 hepatoprotective and renal protective action. The assertion that HF1, HF2, and HF3 are alternate sources for new secondary metabolite is supported by all of the available evidence. The current study has also proved the way for future pharmacological investigations, particularly with regard to all medications derived from the creation of powerful medicines for the management of various chronic conditions.

ACKNOWLEDGEMENT

This work is an end of my wonderful journey leading to Ph.D. in Pharmacology. During this period, I have been accompanied and supported many people without whom it would have been impossible for me to accomplish the task. Now it's time for me acknowledge the effort of all those people who have contributed to my work, described in this report.

With great pleasure, I would like to express my profound gratitude to my supervisor Professor, Dr. Udichi Kataria, Head of the Department of Pharmaceutical Science, Geetanjali Institute of Pharmacy, Udaipur for persistent help, Unconditional support and invaluable suggestions. I would like special thanks to Mr. Subham Anand during my research his support and contribution.

CONFLICT OF INTEREST

All authors declare that there is no conflict of interest.

ABBREVIATIONS

SGOT: Serum Glutamic Oxaloacetic Transaminase; **SGPT:** Serum Glutamic Pyruvic Transaminase; **ALT:** Alanine Aminotransferase; **AST:** Aspartate Aminotransferase; **HF:** Herbal formulation; **AAF:** *Achyranthes aspera* fraction; **AIF:** *Aesculus indica* fraction; **BUN:** Blood Urea Nitrogen; **SOD:** Superoxide Dismutase; **GSH:** Reduced Glutathione; **MDA:** Malondialdehyde.

SUMMARY

This research aimed to create an herbal concoction to alleviate the nephrotoxic effects induced by Cisplatin in Sprague Dawley rats. Utilizing traditional medicinal plants, this formulation demonstrated substantial enhancement in renal function when compared to the group treated with only cisplatin. The biochemical analysis indicated a decrease in serum creatinine and blood urea nitrogen levels, while histopathological examination revealed a reduction in tubular damage and inflammation. Moreover, the formulation displayed potent antioxidant properties, suggesting its potential in alleviating oxidative stress. These results emphasize the viability of this polyherbal formulation as a safeguard against nephrotoxicity in cisplatin therapy. However, further research is necessary to confirm its effectiveness in clinical applications.

AUTHOR'S CONTRIBUTIONS

AC, SA, UK performed whole experimental whole experimental procedures. All authors read and approved the final manuscript.

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Cite this article: Chaudhuri A, Anand S, Kataria U. A Comprehensive Study on *Achyranthes aspera* and *Aesculus indica* Hepatoprotective and Nephroprotective Activities of against Cisplatin Induced Rodent Modal. *Pharmacog Res.* 2024;16(2):315-23.