

Original Research Article

Effect of *Pistia stratiotes* Leaf Extract on Hepatic Functions against Paracetamol Induced Liver Damage in Rats

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Abstract: The *Pistia stratiotes*, called as water lettuce or water cabbage belonging to the family Araceae. The leaves of *Pistia stratiotes* contain alkaloids, glycosides, flavonoids and phytosterols. The aim of the study is to investigate the hepatoprotective activity against paracetamol induced liver damage in rats. Male Wistar albino rats overdosed with paracetamol showed liver damage as specified by increased serum levels of aspartate aminotransferase, alanine aminotransferase, alkaline phosphatase, total bilirubin and decreased activities of total protein compared with the control group. Administration of silymarin and ethanolic root extract of *Pistia stratiotes* (200mg/kg) with paracetamol reversed the elevated levels of aspartate aminotransferase, alanine aminotransferase, alkaline phosphatase, total bilirubin and restored the decreased total protein level. The effect produced by the leaf extract of *Pistia stratiotes* was comparable with that of silymarin. From the result it was concluded that, the ethanolic leaf extract of *Pistia stratiotes* exhibited hepatoprotective and the probable mechanism of action may be due to the presence of flavonoids.

Keywords: *Pistia stratiotes*, Hepatoprotective, Paracetamol and Flavonoids.

INTRODUCTION

Liver is a vital organ with a wide range of physiological functions like metabolism, protein synthesis and production of necessary substances for digestion. Biotransformation is one of the primary functions of the liver, where it process and regulates the substances from the gastrointestinal tract before distributing to the different parts of the body through blood. The common causes of liver disorders include excessive alcohol consumption, infective hepatitis, and drug toxicity. Modern allopathic medicine has very little to offer for the treatment of liver disorders in spite of consistent effort for new drug discovery. There are several herbal formulations used for hepatoprotective activity in the traditional system of medicine in India [1]. However, only a small proportion of these herbal preparations have been evaluated scientifically in animal and clinical studies.

Pistia stratiotes L. commonly known as water lettuce belonging to the family Araceae. *Pistia stratiotes*, also known as 'Jal kumbhi', water cabbage, water lettuce, Nile cabbage, or shellflower is a free floating aquatic plant of streams, lakes and ponds. *Pistia stratiotes* leaves are used as antiseptic, antitubercular and

antidysenteric. Its extract is used as an anodyne for eyewash and for relieving ear complaints. Its ash is applied to scalp for curing ringworm. Leaf extract is used in eczema, leprosy, ulcers, piles, and syphilis. Leaf extract boiled in coconut oil is applied to the skin in chronic dermatitis [2]. Its concoction is useful for relieving nervous disorders, fever and intestinal bacterial infections. *Pistia stratiotes* is useful in the treatment of stomach disorder, throat and mouth inflammation [3]. It was reported that ethanol and hot water fractions of the plant exerts antimicrobial action on a few pathogenic bacteria while chloroform fraction of the same plant possess both antifungal and antibacterial activities on some pathogens [4]. *Pistia stratiotes* plant extracts consist of various alkaloids, glycosides, flavonoids and phytosterols. Due to its beneficial effect on gastrointestinal tract and presence of flavonoids, the current study was conducted to evaluate the hepatoprotective activity of *Pistia stratiotes* leaves against paracetamol induced hepatotoxicity in rats.

MATERIALS & METHODS**Plant Collection**

The leaves of *Pistia stratiotes* was collected from the pond near Pondicherry. The plant was identified as *Pistia stratiotes* and authenticated by Prof. Dr. P. Jayaraman, Director, Plant Anatomy Research Centre, and Chennai. The voucher specimen was deposited in the herbarium for further reference.

Preparation of Extract

The collected leaves were washed in running tap water and shade dried. The dried *Pistia stratiotes* leaves were ground into coarse powder. The powder was then subjected to exhaustive extraction by a maceration process using 70% ethanol as a solvent at room temperature for 7 days. The ethanolic extract was concentrated by vacuum distillation to dry. The collected extract was stored in desiccators and used for further pharmacological study.

Animals

Male Wistar albino rats weighing between 150 – 200 gm were used for this study. The animals were obtained from animal house, Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry. On arrival, the animals were placed at random and allocated to treatment groups in polypropylene cages with paddy husk as bedding. Animals were housed at a temperature of 24±2°C and relative humidity of 30 – 70 %. A 12:12 light: day cycle was followed. All animals were allowed to free access to water and fed with standard commercial pelleted rat chaw. All the experimental procedures and protocols used in this study were reviewed by the Institutional Animal Ethics Committee

and were in accordance with the Institutional ethical guidelines.

Hepatoprotective Activity [5]

The animals were divided into four groups of six animals in each group. Group I served as controls received vehicle 0.1% Carboxy Methyl Cellulose (CMC) solution (1ml/kg). Group II received paracetamol (750 mg/kg) at every 72 h for 21 days through oral route. Group III served as reference control, received silymarin 50 mg/kg for 21 days through oral route and simultaneously administered paracetamol 750 mg/kg every 72 h. Group IV received ethanolic root extract of *Pistia stratiotes* 200 mg/kg, for 21 days through oral route and simultaneously administered paracetamol 750 mg/kg every 72 h. all the test drugs were administered orally using gastric gavage by suspending in 0.1% CMC On 22nd day, blood was collected through retro orbital sinus puncture under anaesthesia using Pentobarbitone sodium (45mg/kg).

The collected blood samples were centrifuged for 10 minutes at 2000 r.p.m. and serum was separated. The separated serum was subjected to various biochemical tests like Serum Glutamate Oxaloacetate Transaminase (SGOT), Serum Glutamate Pyruvate Transaminase (SGPT) [6], Serum Alkaline Phosphate (SALP) [7], serum bilirubin [8] and total protein [9].

STATISTICAL ANALYSIS

The values were expressed as mean ± SEM. The statistical analysis was carried out by one way analysis of variance (ANOVA) followed by Dunnet's 't' – test using graph pad. P values <0.05 were considered significant.

RESULTS

Table: 1: The table shows the effect of *Pistia stratiotes* root extract on paracetamol induced liver damage in rats.

Drug Treatment	Liver Function Test				
	SGOT (IU/L)	SGPT(IU/L)	SALP(IU/L)	Total Bilirubin (mg/dl)	Total Protein (mg/dl)
Group I Vehicle Control 0.1% CMC	45.32±3.72	58.45±2.73	44.32±4.88	1.73±0.02	9.62 ±0.73
Group II Paracetamol (750 mg /kg)	189.45 ±6.81	121.79 ±8.44	185.65±5.53	4.57 ±0.26	3.90 ±0.14
Group III Silymarin (50mg/kg)	48.72 ±3.20***	65.70±5.13***	49.72 ±2.97***	2.07 ±0.19***	8.72±0.62***
Group IV <i>Pistia stratiotes</i> Extract (200mg/kg)	62.76 ±2.98***	78.03±3.43***	71.43±3.32***	2.97±0.13***	4.57 ±0.28**

Values are in mean ± SEM (n=6),

*P<0.05, **P<0.01, ***P<0.001 Vs Paracetamol Control

The results of hepatoprotective activity of ethanolic leaf extract of *Pistia stratiotes* on Paracetamol treated rats are shown in Table 1. The hepatic enzymes SGOT, SGPT, SALP in serum and total bilirubin were increased and total protein was decreased in paracetamol treated animals when compared to vehicle control. The reference control silymarin reversed the levels of serum enzymes, total bilirubin and total protein on the paracetamol induced hepatic injury by significantly ($P < 0.001$) reduced the serum hepatic enzymes, total bilirubin and decreasing the total protein. Similar effect was produced by the ethanolic leaf extract of *Pistia stratiotes* against paracetamol induced hepatic damage in rats.

CONCLUSION

The hepatoprotective activity of ethanolic leaf extract of *Pistia stratiotes* was studied on paracetamol induced hepatotoxicity in rats. From the results, it was concluded that ethanolic leaf extract of *Pistia stratiotes* exhibits significant hepatoprotective activity against paracetamol induced hepatotoxicity. The hepatoprotective activity of ethanolic leaf extract of *Pistia stratiotes* may be due to the presence of flavonoids in it.

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