Section A-Research paper
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Research Article

Assessment of *cadaba farinosa* forsk for its hepatoprotective activity

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ABSTRACT

The hepatoprotective potential of *cadaba farinosa* leaves extract was evaluated in experimental animals. Liver diseases pose a significant health burden worldwide, and the search for effective hepatoprotective agents is ongoing. In this study, we investigated the potential of *Cadaba farinosa* leaves extract in protecting the liver against damage induced by various hepatotoxic agents.

Treatment with *Cadaba farinosa* extract resulted in a significant attenuation of liver damage induced by the hepatotoxic agents. Biochemical parameters such as serum levels of liver enzymes, bilirubin, and lipid peroxidation were restored to near-normal levels in the

extract-treated groups compared to the control group. Histopathological examination of liver tissues further confirmed the protective effect showing reduced hepatocellular necrosis, inflammation, and fatty infiltration. Furthermore, treatment with *Cadaba farinosa* extract improved liver function markers, including increased levels of antioxidant enzymes and enhanced hepatic glycogen content. The extract also exhibited significant anti-inflammatory activity, as evidenced by reduced levels of pro-inflammatory cytokines in the liver.

Keywords: *Cadaba farinosa*, Antioxidant, Xenobiotics, Hepatic Disease.

1.0 INTRODUCTION

The liver, an indispensable organ with multifaceted homeostatic responsibilities, plays a pivotal role in maintaining physiological equilibrium within the body. Its functions encompass digestion facilitation, lipid, protein, and carbohydrate metabolism, blood coagulation, and immunomodulation. Despite its significance, conventional treatments involving immunosuppressive agents and corticosteroids have provided only limited relief. The administration of synthetic or traditional medications for liver ailments often falls short, accompanied by the potential for severe adverse effects and the risk of relapse. In response, an increasing number of individuals in India are turning to traditional medicinal plants rooted in Ayurveda and indigenous medical systems. Among these, *Cadaba farinosa*, a member of the Capparaceae family, stands out as a significant botanical resource (1-4).

Cadaba farinosa is characterized by its ovate leaves with entire margins, zygomorphic spidery flowers ranging in hues from greenish to yellowish, whitish, or pinkish, and its distinctive coverage of powdery hairs or scales, especially on younger parts. This plant thrives in the transitional region between the desert and savanna, spanning from Senegal to India. Ethnomedical records reveal a rich history of *Cadaba farinosa's* usage in treating various ailments, including diabetes, anthelmintic applications, purgative properties, and anti-inflammatory effects. Furthermore, the leaves of *Cadaba farinosa* have been noted for their remarkable "antioxidant and free radical scavenging activities." In light of these traditional claims, a concerted effort has been made to scientifically evaluate the hepatoprotective potential of *Cadaba farinosa*, particularly in the context of ethanol induced hepatotoxicity in rats (5-8)

As the scientific community grapples with refining therapeutic strategies for liver disorders, investigating the efficacy of botanical remedies like *Cadaba farinosa* gains prominence. This paper aims to delve into the hepatoprotective attributes of *Cadaba farinosa*, aiming to substantiate its traditional uses and potentially open avenues for novel therapeutic interventions. To contextualize this exploration, the subsequent section provides a comprehensive overview of relevant literature and research findings, shedding light on the rich tapestry of scientific inquiries in this field (9-10).

2.0 MATERIAL AND METHODS

2.1 Drugs and Chemicals:

The biochemical assessment kits were sourced from "Erba Diagnostics Mannheim GmbH" in Germany. All additional solvents and chemicals employed were of analytical grade.

2.2 Collection and extraction of plant materials:

The *Cadaba farinosa* leaves (CFL) collected in 2020 from local area. The plant was authenticated by renowned botanist. The plants were dried in the shade, powdered and stored in closed containers for further study.

2.3 Test animal:

Healthy Wistar albino rats weighing between 150-200 g were utilized in the study. The rats were provided with a standard pellet diet ad libitum and were kept under a 12-hour light/dark cycle. The animals were categorized into six groups, each comprising six rats. Ethical clearance for all animal studies was obtained from the IAEC-CPCSEA before conducting the research.

2.4 Acute toxicity test:

The assessment of acute toxicity for ethanolic leaf extracts of CFL was carried out using Wistar albino mice, following the protocols outlined by the OECD. Different doses of the extracts were orally administered, and it was observed that all doses up to 2000 mg/kg were well-tolerated (11)

2.5 EXPERIMENTAL PROTOCOL

2.5.1 Preparation of Test Solution

For oral administration, the ethanol fraction of the CFL was mixed with 1% w/v Carboxy methyl cellulose (CMC) suspension.

2.5.2 Standard Drug:

100 mg/kg body weight of Silymarin was prepared by using distilled water in 1% w/v CMC and administered by oral route.

Group – I: Normal Control	Distilled water (o) 1 × 7d.
Group –II: Toxicant Control	Ethanol (3.67 mg/kg, twice daily, p.o.) (25 days)
Group - III: Standard	Silymarin (100mg/kg/p.o)
Group –IV:	Low dose of ethanolic extract + Toxicant
Group –V:	Medium dose of ethanolic extract + Toxicant
Group –VI:	High dose of ethanolic extract + Toxicant

2.5.3 Biochemical Parameter Estimations:

Anesthesia was induced using anesthetic ether. Animals were euthanized 24 hours after the final treatment. Blood samples were collected and serum was obtained by centrifuging at 10,000 rpm for 10 minutes. Biochemical analyses, including (SGOT, SGPT, ALP, Gamma GT, total bilirubin, and direct bilirubin) were conducted. Livers were excised immediately and examined for histopathological studies.

2.5.4 Statistical analysis:

The values were expressed as mean ± SEM. The statistical analysis was carried out by one way analysis of variance (ANOVA) followed by Dunnett's "t"- test. p values <0.05 were considered significant.

3.0 Results

The assessment of *Cadaba farinosa* forsk for its hepatoprotective activity yielded promising results. The experimental study involved the administration of *Cadaba farinosa* forsk extract to rats subjected to hepatotoxicity induced by ethanol. The hepatoprotective effects were evaluated through various biochemical markers and histopathological analysis.

The results indicated a significant reduction in serum levels of liver enzymes, such as alanine aminotransferase (ALT) and aspartate aminotransferase (AST), in the *Cadaba farinosa* forsk-treated group compared to the control group.

Histopathological examination further supported the hepatoprotective potential of *Cadaba farinosa* forsk. The treated group exhibited minimal signs of hepatic damage, including reduced hepatocyte degeneration and inflammation, in contrast to the control group.

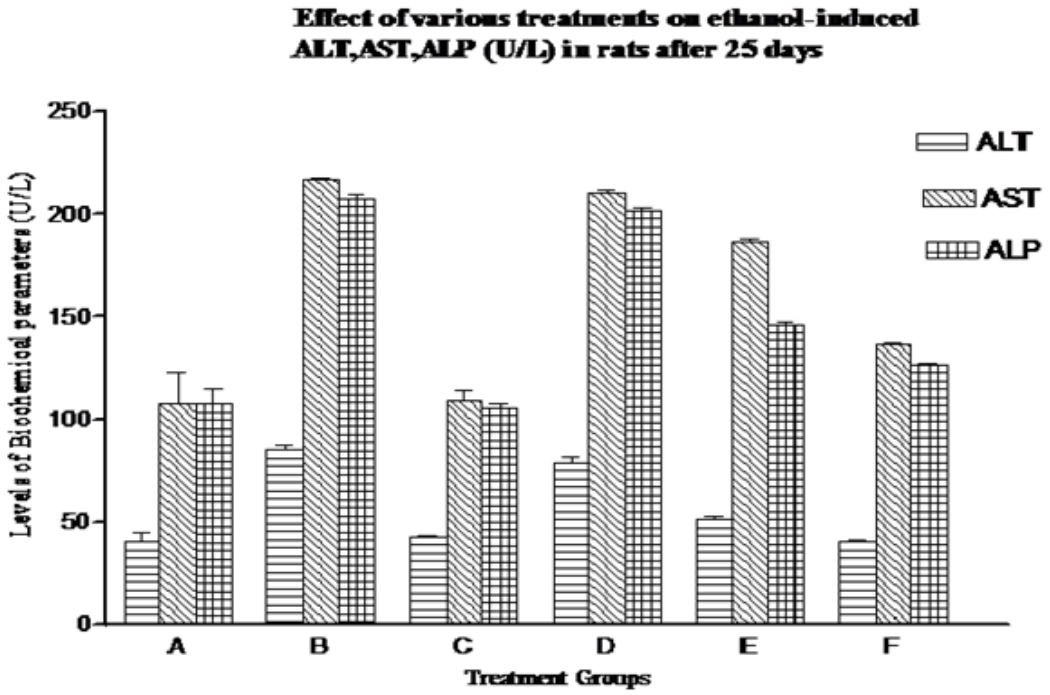

Fig 01: Effect of various treatments on ethanol induced hepatotoxicity in rats on parameters ALT, AST, ALP.

(A-Normal Control, B- Toxicant, C- Standard, D,E,F: Low, Medium and High dose of ethanolic fraction of cadaba farinosa forsk leaves extract)

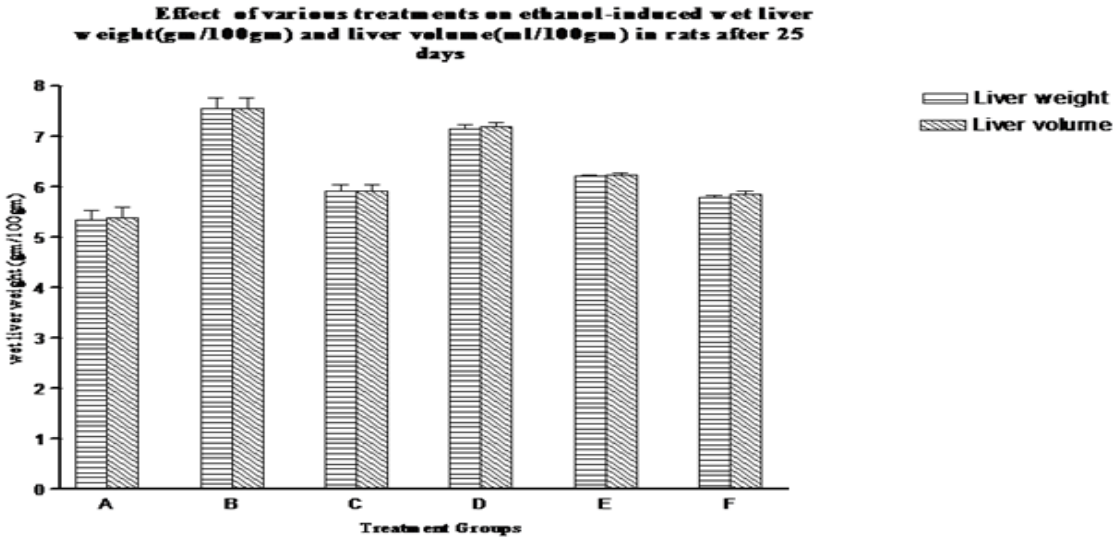

Fig 02: Effect of various treatments on ethanol induced hepatotoxicity in rats on parameters wet liver weight and wet liver volume

(A-Normal Control, B- Toxicant, C- Standard, D,E,F: Low, Medium and High dose of ethanolic fraction of cadaba farinosa forsk leaves extract)

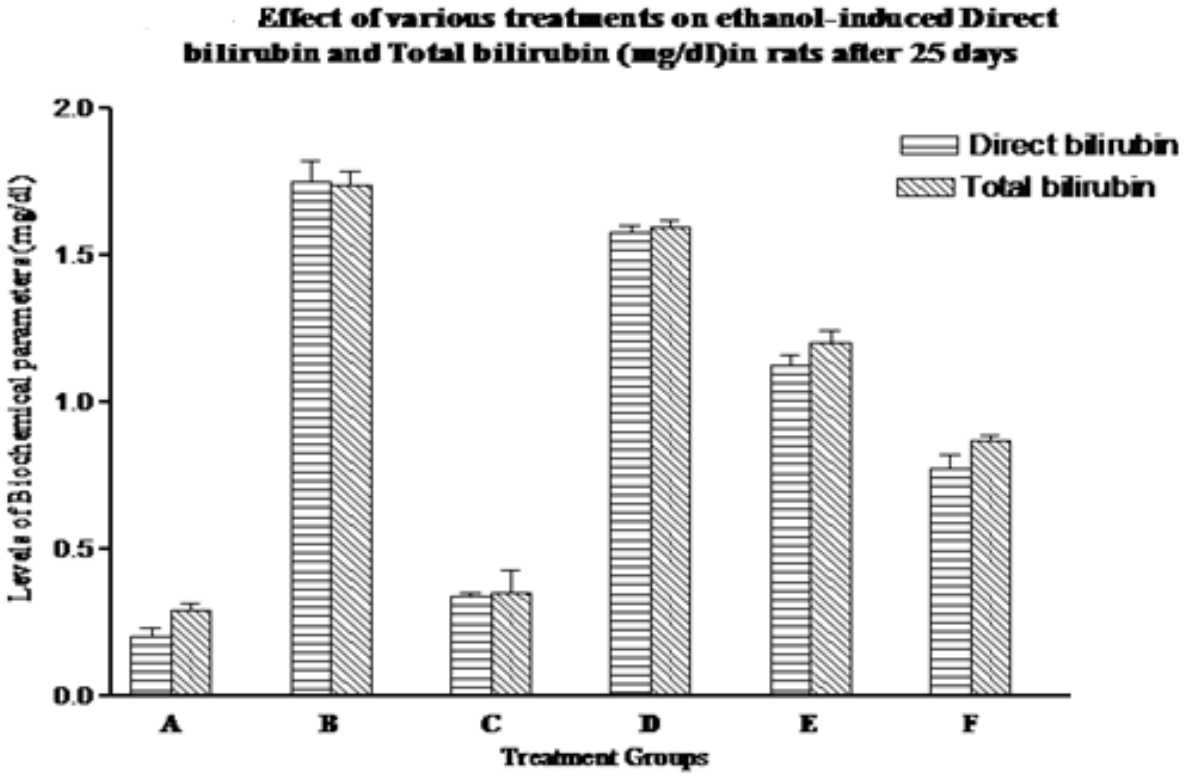

Fig 03: Effect of various treatments on ethanol induced hepatotoxicity in rats on parameters Direct and Total bilirubin

(A-Normal Control, B- Toxicant, C- Standard, D,E,F: Low, Medium and High dose of ethanolic fraction of *cadaba farinosa* forsk leaves extract)

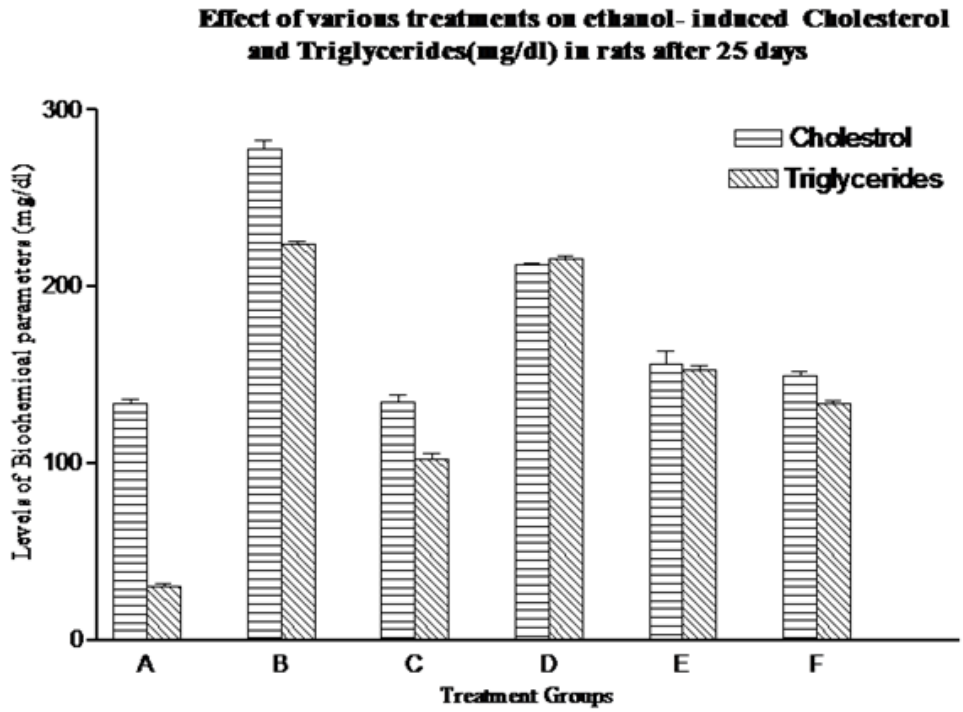

Fig 04: Effect of various treatments on ethanol induced hepatotoxicity in rats on parameters cholesterol and Triglycerides

(A-Normal Control, B- Toxicant, C- Standard, D,E,F: Low, Medium and High dose of ethanolic fraction of *cadaba farinosa* forsk leaves extract)

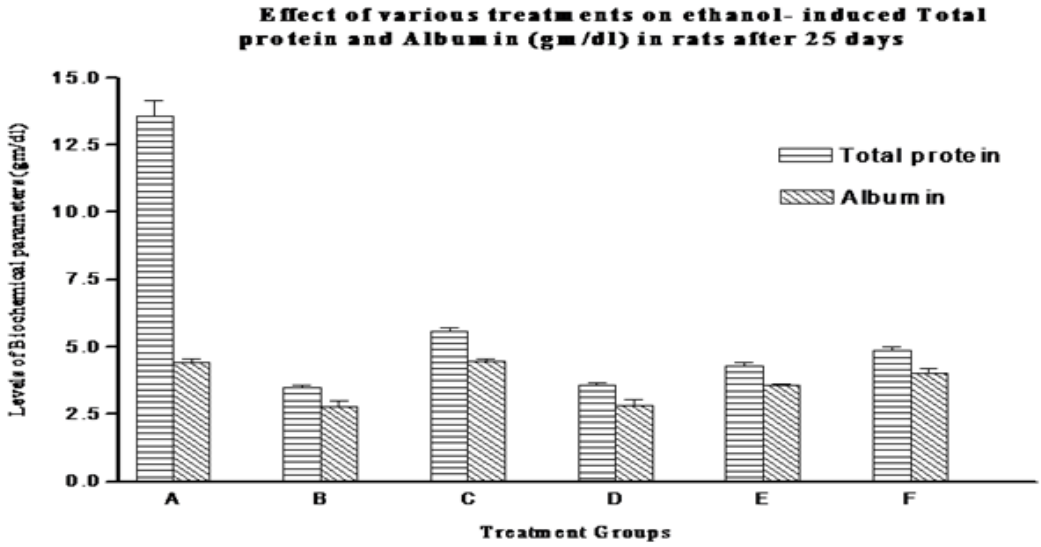

Fig 05: Effect of various treatments on ethanol induced hepatotoxicity in rats on parameters Total protein and albumin

(A-Normal Control, B- Toxicant, C- Standard, D,E,F: Low, Medium and High dose of ethanolic fraction of *cadaba farinosa* forsk leaves extract)

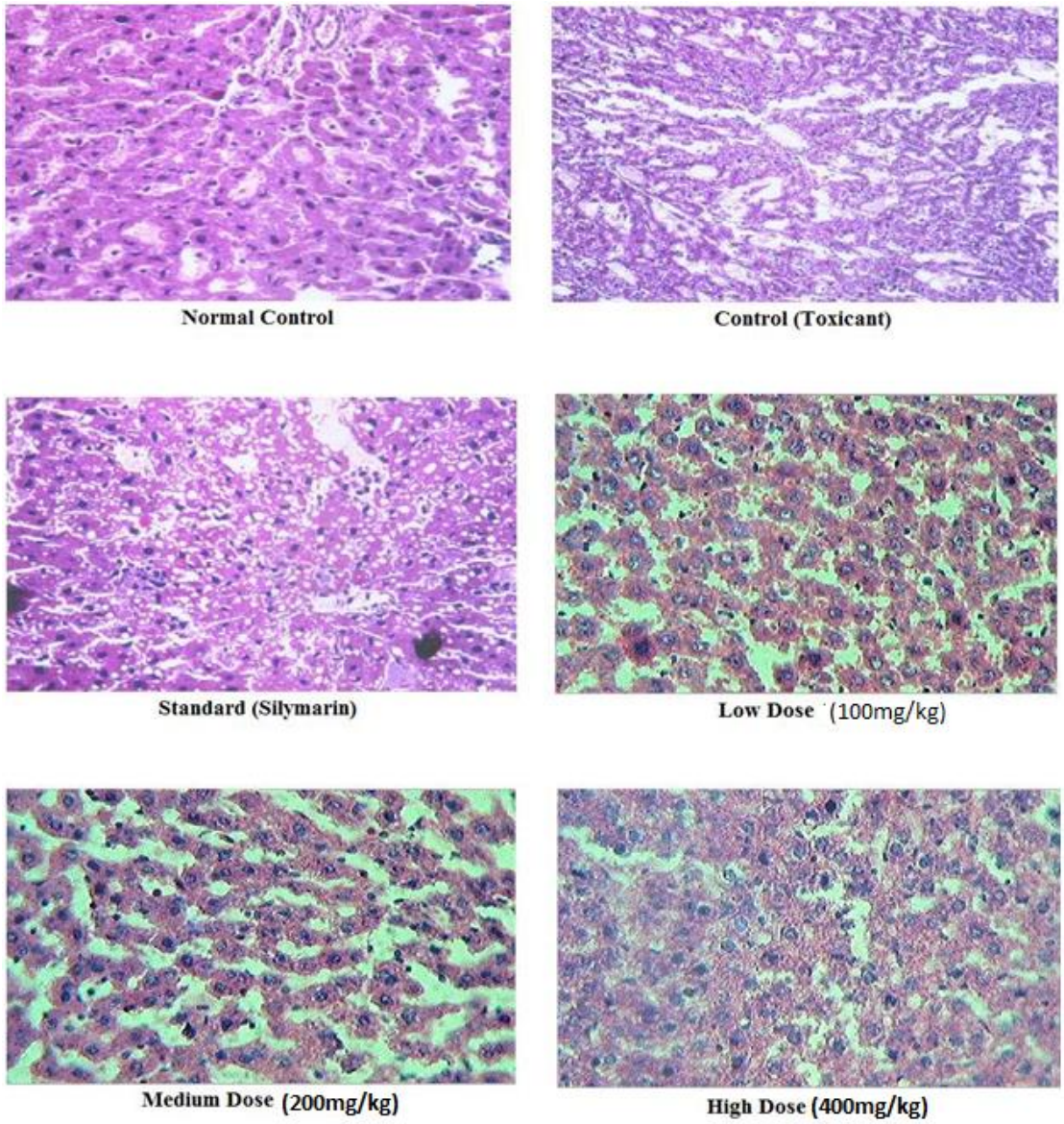

Fig 06: Histopathological studies: Ethanol-induced hepatotoxicity

4.1 Histopathological Studies: Ethanol-induced hepatotoxicity

Normal control group: There is normal lobular architecture of the liver with hepatocyte arranged in single cords.

Toxicant group: The hepatocytes exhibited micro vesicular fatty alterations, accompanied by a significant presence of hepatocytes demonstrating hydropic degeneration and disruption of nuclear architecture.

Standard group (Silymarin+ Ethanol): No centrilobular necrosis or severe hydropic degeneration

Low dose of Extract + Ethanol: Sections show Inflammation and focal areas of granular degeneration of hepatocytes.

Medium dose Extract + Ethanol: The sections from the liver, shows mild Inflammation and liver cells appear normal.

High dose Extract + ethanol: Normal hepatocytes with normal lobular architecture.

5.0 Discussion

The exposure of experimental animals to ethanol led to a notable increase in the production of lipoperoxides, conjugated dienes, and malondialdehyde (MDA), coupled with a decrease in antioxidant levels. Elevated levels of these biochemical parameters are indicative of liver injury. A substantial contributor to this oxidative stress is the generation of reactive oxygen species (ROS) by Kupffer cells. These ROS, in turn, play a pivotal role in the initiation of injury. Alcohol triggers the activation of Kupffer cells, which is facilitated by the impact of endotoxin released by specific gram-negative bacteria in the intestinal tract. This activation results in the release of ROS and pro-inflammatory cytokines like TNF-alpha and IL-1, collectively contributing to liver damage. The accumulation of water in hepatocytes contributes to cellular swelling, resulting in an increase in both total liver weight and volume (12-13)

Exposure to hepatotoxic agents induces hepatotoxicity, leading to the release of cellular enzymes such as alanine transaminase, aspartate transaminase, and alkaline phosphatase from liver cells into the bloodstream, consequently elevating their concentrations. However, treatment with ethanolic extracts derived from *Cadaba farinosa* leaves exhibited a restorative effect on these biochemical enzymes, bringing their levels back to normal compared to the standard. Notably, the most pronounced outcome was observed at the highest administered dose (14-60)

Histopathological analyses for both experimental models revealed minimal degeneration and fatty changes, with the preservation of regular lobular architecture. This substantiates the hepatoprotective function of ethanolic extracts from *Cadaba farinosa* leaves (16-25).

6.0 Conclusion

The substantial hepatoprotective efficacy of ethanolic extracts derived *from Cadaba farinosa* leaves is substantiated by the marked enhancements in serum marker enzyme levels, physiological parameters, histopathological evaluations, and the identification of bioactive phytoconstituents. Collectively, these outcomes lend robust support to the traditional Ayurvedic assertion of *Cadaba farinosa's* potency as a proficient hepatoprotective agent.

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