



HEPATOPROTECTIVITY AND AN ANTIOXIDANT STUDY OF *IPOMOEA HEDERACEA* ON EXPERIMENTALLY INDUCED HEPATOTOXIC RATS

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Abstract

Ipomoea hederacea extract, a novel hepatoprotective drug has been shown to provide an antioxidant potential against carbon tetra chloride treated experimentally induced hepatotoxic rats in comparison with standard hepatoprotective drug *silymarin*. Significantly raised levels of serum bilirubin, lipid peroxides and decreased activities of antioxidant enzymes such as superoxide dismutase, catalase, glutathione peroxidase, glutathione reductase and decreased activities of gamma glutamyl transpeptidase were observed and it was nearer to normal in *Ipomoea hederacea* administrated experimentally induced hepatotoxic rats. These observations clearly suggested the hepatoprotectivity and antioxidant property of *Ipomoea hederacea*.

Keywords: *Ipomoea hederacea*, Hepatoprotectivity, Antioxidant potential, Silymarin

Introduction

Liver plays a major role in detoxification and excretion of many endogenous and exogenous compounds, any hepatic injury or impairment of its function may lead to many pathological complications. Hepatotoxicity (from hepatic toxicity) implies chemical-driven liver damage. The liver plays a central role in transforming and clearing chemicals and is susceptible to the toxicity from these agents. Certain medicinal agents when taken in overdoses and sometimes even when introduced within therapeutic ranges may injure the organ. Other chemical agents such as those used in laboratories and industries, natural chemicals and herbal remedies can also induce hepatotoxicity¹

Ipomoea hederacea considered as a valuable herb for indigenous medicine, is renowned for its medicinal properties. It is an annual herb which is beneficial and known for their medicative properties. Herbs had been used by all cultures throughout history but India has one of the oldest, richest and most diverse cultural living traditions associated with the use of medicinal plants. In the present scenario, the demand for herbal products is growing exponentially throughout the world and major pharmaceutical companies are currently conducting extensive research on plant materials for their potential medicinal value. In the present study, we made an attempt to investigate the hepatoprotective effect and antioxidant efficacy of *Ipomoea hederacea*.

Materials and Methods

Ipomoea hederacea extracted in ethanol as per the method of Muhammad Zia Ul HAQ *et al*²

Experimental animals

Male albino rats weighing 100g-200g were divided into four groups of six animals each. The animals were housed in polypropylene cages under controlled conditions and fed with standard feed and free access to water; fresh dry husk was used as bed material. The animals received commercial rat diet and water *ad libitum*. This study conformed to the guiding principles of Institutional Animal Ethical Committee (IAEC), Committee for the purpose of Control and Supervision of Experiments on Animals (CPCSEA) and the Guide for the care and use of laboratory animals.

Experimental design

Induction of hepatotoxicity

The rats were divided into 4 groups and each group contains 6 rats. Carbon tetra chloride (Ccl₄) was administered through intraperitoneal route, silymarin and *I. hederacea* was administered through oral route.

Group: I

Control Rats

Group: II

Ccl₄ treated rats (1ml/kg body weight)

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Group: III

CCl_4 and *silymarin* treated rats (CCl_4 1ml/kg body weight and *silymarin* 25mg/kg body weight)

Group: IV

CCl_4 and *I. hederacea* treated rats (CCl_4 1ml/kg body weight and drug 200ml/kg body weight)

Mode of herbal drug Administration

200mg of *I. hederacea* and *silymarin* was administered through oral route. The experiment was carried out for 14 days. After this treatment, the rats were fixed on the operation table by ventral side up and the liver was dissected out and homogenized in phosphate buffer PH 7.4 and used for various experimental methods.

Biochemical assays

Serum bilirubin³ Malondialdehyde (MDA)⁴, antioxidant enzymes such as catalase⁵, super oxide dismutase⁶ glutathione peroxidase⁷ glutathione reductase⁸ and gamma glutamyl transpeptidase (GGT)

⁹ were assayed in serum and liver tissues. Protein in serum was estimated by the method of Lowry *et al.*¹⁰, using crystalline bovine serum albumin as the reference standard.

Statistical analysis

All values used in analysis represented as mean \pm S.D of 6 rats.

Results and Discussion

There was a statistically significant increase in the liver MDA and serum bilirubin levels in hepatotoxic rats and were decreased in *I. hederacea* and *silymarin* administered hepatotoxic rats as compared to controls (Table 1). The activities of SOD, catalase, GPx, glutathione reductase and GGT were significantly decreased in experimentally induced hepatotoxic rats and were significantly increased in *I. hederacea* and *silymarin* administered hepatotoxic rats as compared to controls (Table-2).

Table 1. Levels of serum bilirubin and lipid peroxide GGT in liver homogenates

Groups	Serum bilirubin (mg/ml)	MDA (U/mg protein)	GGT (U/g tissue)
Normal	0.49 \pm 0.30	1.28 \pm 0.081	0.21 \pm 0.081
CCl_4	4.02 \pm 0.098	2.71 \pm 0.081	0.26 \pm 0.081
Silymarin	0.49 \pm 0.41	1.82 \pm 0.081	0.23 \pm 0.081
<i>I. hederacea</i>	0.28 \pm 0.08	1.68 \pm 0.081	0.23 \pm 0.081

The values are expressed as mean \pm SD (N = 6)

Table 2. Activity of Super oxide dismutase, catalase, Glutathione peroxidase (GPx), glutathione reductase (GRD) in liver homogenates

Groups	SOD (U/Mg protein)	CAT (U/mg protein)	GPX (U/mg protein)	GRD (U/mg protein)
Normal	13.26 \pm 0.082	9.24 \pm 0.081	0.91 \pm 0.081	7.21 \pm 0.081
CCl_4	7.21 \pm 0.081	4.87 \pm 0.081	0.58 \pm 0.081	4.24 \pm 0.081
Silymarin	10.41 \pm 0.082	7.24 \pm 0.081	0.81 \pm 0.081	6.20 \pm 0.081
<i>I. hederacea</i>	12.21 \pm 0.081	8.24 \pm 0.081	0.84 \pm 0.081	6.62 \pm 0.081

The values are expressed as mean \pm SD (N = 6)

Free radicals and lipid peroxide radicals have been implicated in liver diseases¹¹. These reactive oxygen species (ROS) are produced as a normal consequence of biochemical processes in the body and as a result of increased exposure to xenobiotics¹². The mechanism of free radical damage include ROS-induced peroxidation of polyunsaturated fatty acid in the cell membrane bilayer, which causes a chain reaction of lipid peroxidation, The cytoprotective effects of *I. hederacea* are mainly attributable to its antioxidant and free radical scavenging properties. Silymarin can also interact directly with cell membrane components to prevent any abnormalities in the content of lipid

fraction responsible for maintaining normal fluidity¹³. Rise in MDA could be due to increased generation of reactive oxygen species (ROS) due to the excessive oxidative damage generated by liver toxicity. The decrease in the levels of these enzymatic antioxidant parameters may be due to the increased turnover, for preventing oxidative damage in these patients suggesting an increased defense against oxidant damage. Hence variations in antioxidant system provide the basis of liver damage. These include reduced glutathione, GPX, SOD, CAT etc¹⁴. In the present investigation the increased activities of antioxidant enzymes in *Ipomoea hederacea* in

experimentally induced hepatotoxic rats, may be a compensatory regulation in response to increased oxidative stress.

Conclusion

Ipomoea hederacea is a favoured drug for different liver diseases because of its oral effectiveness, good safety profile, availability in India. It has established efficacy in the restoration of liver function and regeneration of liver cells. It may prove superior to polyherbal formulations for its better standardization, quality control and free from contamination from heavy metals and microbial toxins. *Ipomoea hederacea* may make a breakthrough as a new approach to protect other organs in addition to liver.

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