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Evaluation of Hepatoprotective activity of Leaves of *Abutilon indicum* (L.) Sweet against Paracetamol induced Liver toxicity in Albino rats

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Abstract

Liver disease refers to a range of conditions that cause harm to the human liver's tissues, structures, and cells. The liver performs numerous vital tasks, making it prone to errors. One of the most prevalent causes of liver illness is inflammation, which is frequently caused by alcohol, a poor diet, or starvation. Drug-induced liver injury or failure is a major public health issue that affects not only medical professionals, but also the pharmaceutical business and the Drug Control Board. According to the American Acute Liver Failure Study Group, more than half of acute liver failure patients contain idiosyncratic liver injury induced by other medicines, such as paracetamol overdose (39%). The present study investigates the hepatoprotective activity of a ethyl acetate extract of *Abutilon indicum* (Leaves) against paracetamol-induced liver damage in albino rats. The results reveal that the ethyl acetate extract had considerable hepatoprotective action when compared to the hepatotoxic control at a dosage of 250 mg/kg.

Keywords: Liver disorders, *Abutilon indicum*, Paracetamol induced

Introduction

Indian indigenous medicinal herbs are most commonly used to cure a variety of ailments, either alone or in combination, in both raw and extracted form. Synthetic hepatoprotective drugs can have substantial side effects and are not safe to use during pregnancy.[1] In this view, herbal remedies are favoured for the treatment of liver problems. According to ancient ayurvedic literature, the selected plant, *Abutilon indicum* (Leaves), has been widely utilised to cure liver diseases. The herbs have been extensively utilised in Ayurveda and traditional medicine for the treatment of liver problems, and they have been shown to be efficient and economical when compared to synthetic medications, albeit they have not been scientifically tested. [2] As a result, it was worthwhile to explore the hepatoprotective properties of *Abutilon indicum* (leaves).

Abutilon indicum (Linn.) Sweet, often known as Kanghi (H), belongs to the Malvaceae family. The plant can be found growing wild in Central India. The plant includes saponins, flavonoids, and alkaloids. The plant has several significant compounds, including β-sitosterol, vanillic acid, p-coumaric acid, caffeic acid, and fumaric acid. The plant stem contains steroids, sapogenins, sugars, and flavonoids. Almost all of the parts are medicinal in nature and have traditionally been used to cure a variety of diseases.

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The plant's roots are thought to be demulcent, diuretic, and effective against chest infections and urethritis. The root infusion is used as a cooling remedy in fevers and is said to help with strangury, haematuria, and leprosy. The leaves have been proven to be effective in treating ulcers and liver diseases. The bark is used as a febrifuge, antihelmintic, alexeteric, astringent, and diuretic. The seeds are used to treat piles, as a laxative and expectorant, as well as chronic cystitis, gleet, and gonorrhoea. [2-3]

Material and Methods

Collection of herbs and their authentication

The leaves of *Abutilon indicum* were collected from local sites in the Malwa region of Madhya Pradesh, India in January 2021, identified morphologically and microscopically, and compared with standard pharmacopoeial monographs. They were authenticated by Dr. S. N. Dwivedi, Retd. Prof. and Head, Department of Botany, Janata PG College, A.P.S. University, Rewa, (M.P.) and deposited in our Laboratory. Voucher specimen J/Bot./AIL-012 was assigned to the chosen plant components.

Extraction of selected herbs

The shade dried coarsely powdered plant material (250 gms) of *Abutilon indicum* leaves was placed into a Soxhlet device and extracted for 48 hours with ethyl acetate. Following the end of the extraction, the solvent was evaporated. The extracts were dried using a rotating evaporator. The residue was subsequently stored in the dessicator.[4-5]

Pharmacological screening

Acute Toxicity Studies of Extracts

The mice were employed in an acute toxicity study according to OECD guidelines 423. The animals were fed a normal pellet food (Hindustan lever Ltd., Bangalore) and given access to water as needed. All animals were kept in polypropylene cages. The animals were kept in an alternate 12-hour cycle of darkness and light. Prior to beginning the experiment, the animals were acclimatised to the laboratory conditions for one week. The Institutional Animal Ethics Committee accepted the experimental protocols after thorough review. [6]

Hepatoprotective activity of extracts [7-8]

Test Compounds

The ethyl acetate extract of Abutilon indicum and the standard medication silymarin (50 mg/kg body weight) were utilised.

Chemicals and Reagents

Paracetamol, Silymarin.

Experimental Animal

The albino rats (200-250 g) used in the current experiments were obtained. The animals were fed a normal pellet food (Hindustan lever Ltd., Bangalore) and given access to water as needed. Prior to use, all of the animals were acclimatised for one week.

Paracetamol Induced Model

The rats were divided into 4 groups of 6 animals in each. Group I is Normal: Received vehicle gum acacia (5mg/kg p.o) for 7days; Group II is Control: Received vehicle gum acacia (5 mg/kg p.o) for 7 days once daily and paracetamol 500mg/kg once daily; Group III is standard: Received silymarin as standard (50 mg/kg) for 7 days once daily and paracetamol 500mg/kg once daily and Group IV is treated Received EAEAIL (250 mg/kg) once daily and paracetamol 500mg/kg once daily. On the seventh day, blood samples were taken via orbital sinus puncture for biochemical marker enzyme quantification and allowed to clot, after which serum was separated by centrifugation at 2500 rpm for 15 minutes and analysed for various biochemical parameters. The liver was then carefully separated, cleansed of extraneous tissue, and kept in 10% neutral formalin prior to histological examination.

Statistical Analysis

All values were statistically analysed using one-way ANOVA, followed by the Dunnette multiple comparisons test. * $P<0.01$ and ** $P<0.001$ indicate statistical significance when compared to the relevant control. The values are provided as mean ± SEM.

Assessment of Liver Function

The liver was removed and weighed**.** Biochemical parameters i.e., Serum glutamic Pyruvate transaminase (SGPT), serum Glutamic Oxaloacetic Transaminase (SGOT), Alkaline phosphatase (ALP) were analyzed according to the reported methods.

Histopathological Studies

Liver slices fixed for 12 hrs in Bouin's solution were processed for paraffin embedding following standard micro technique. 5µ section of the livers stained with alum haematoxylin and eosin, were observed microscopically for histopathological changes i.e., normal liver, damaged and recovered liver were studied and compared.

Results and Discussion

The ethyl extracts of Abutilon indicum leaves were tested for acute toxicity using OECD guideline no. 423 to determine the LD50. The LD 50 was found to be 250 mg/kg bw. The results for effect of ethyl acetate extract of leaves of *Abutilon indicum* on paracetamol induced hepatotoxicity in rats is hown in table 1. The results of treatment and transplantation are shown in the table. In the case of toxic liver, the level of gastric phosphate is too high and may be due to increased hepatic secretion or increased production of ALP by liver parenchyma or duct cells. Since the extract significantly reduced ALP levels, it suggests that this extract has significant hepatoprotective activity. Liver weight of animals treated with hydro-alcoholic extract of Abutilon leaves index compared with treatment of conventional drug silymarin (50mg/kg). The ethyl acetate extract showed a significant decrease in liver weight similar to the conventional drug silymarin, thus indicating a significant hepatoprotective activity of the extract. The results was presented in table 2.

Table 1: Effect of Ethyl acetate extract of leaves of *Abutilon indicum* on paracetamol induced hepatotoxicity in rats

Treatment	Total Bilirubin (mg %)	Direct Bilirubin (mg %)	SGOT (µ/min/l)	SGPT (µ/min/l)	ALP (µ/min/l)
Normal	0.42 ± 0.20	0.42 ± 0.60	180.12 ± 2.11	76.40 ± 2.22	190.0 ± 6.22
Induced (PCM 2g/kg)	8.60 ± 2.02	7.41 ± 8.61	342.40± 10.02	151.7± 8.04	357.22±8.80
Standard (Silymarin 50mg/kg)	0.51 ±4.09**	0.48 ±0.18**	196.21±9.03**	89.07±8.72**	198.21 ±10.11**
EAEAIL (250 mg/kg)	0.58 ± 4.21*	0.53 ± 0.18*	207.11± 8.21*	97.821± 4.52*	217.39± 8.11*

Values are mean ±SEM, n= 6. (One way ANOVA Followed by Dunnette multiple Comparisons test). Statistically significance of * P<0.01, ** P<0.001, when compared with respective control

Table 2: Effect hydro-alcoholic extract of leaves of *Abutilon indicum* on liver weight variation of paracetamol induced hepatotoxicity in rats

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Treatment	Liver weight in g/100g
Normal	6.80 ± 0.42
Induced (PCM 2g/kg)	8.21 ± 0.22
Standard (silymarin 50mg/kg)	7.11 ± 0.23**
EAEAIL (250 mg/kg)	8.11± 0.11

Values are mean ±SEM, n= 6. (One way ANOVA Followed by Dunnette multiple Comparisons test). Statistically significance of * P<0.01, ** P<0.001, when compared with respective control.

Conclusion

Liver problems are both common and concerning. The present study investigated the hepatoprotective activity of a hydroalcoholic extract of the leaves of Abutilon indicum, an indigenous medicinal plant, in the liver treated with paracetamol against toxicity in albino rats, and the results showed that the extract showed

significant hepatoprotective activity compared to the hepatotoxic control at a dose of 250 mg/kg.

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