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Investigation of Hepatoprotective activity of Herbal Formulation containing hydroalcoholic extract of *Abutilon indicum* against Paracetamol induced Liver toxicity in Albino rats

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Abstract

A variety of conditions that harm the human liver's tissues, structures, and cells are together referred to as liver diseases. The liver is prone to various errors since it performs so many vital processes. Inflammation is one of the most frequent causes of liver illness and is frequently brought on by alcohol, a bad diet, or malnourishment. Drug-induced liver damage or liver failure is a serious health emergency that poses problems for the Drug Control Board, the pharmaceutical sector, and medical experts alike. The American Acute Liver Failure Study Group reports that idiosyncratic liver injury from other medicines, such as hepatotoxicity from an overdose of paracetamol, accounts for more than half of instances of acute liver failure (39%). This paper examines the hepatoprotective properties of a herbal tablet containing hydro-alcoholic extract of *Abutilon indicum* (Stem) in relation to liver damage in albino rats caused by paracetamol. Comparing the herbal tablet containing hydro-alcoholic extract to the hepatotoxic control at a dose of 200 mg/kg, the results suggest a considerable hepatoprotective action.

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

Introduction

The field of herbal medicine has grown exponentially in the past several years, and due to their natural origins and low side effects, these medications are becoming more and more popular in both developed and developing nations. Medicinal plants, minerals, and organic materials are the source of many commonly used traditional medications. Many medicinal plants known as rasayana, which have been utilised for over a millennium, are included in herbal remedies used in Indian traditional medical systems. The majority of medical professionals in Indian systems create and administer their own concoctions. 21,000 plants are registered by the World Health Organisation (WHO) as being used medicinally worldwide. Of these 2500 species, 150 are used on a reasonably considerable scale in commercial settings in India. India is known as the world's botanical paradise and is the world's largest producer of medicinal plants. [1-3]

Indian Native medicinal plants are most frequently utilised, either alone or in combination, to cure a variety of illnesses. They can also be used in extract form. In addition to having a number of dangerous side effects, synthetic hepatoprotective drugs should not be used while pregnant. In light of this, using herbal remedies to treat liver problems is recommended. The chosen plant, Abutilon indicum (Stem), has been utilised extensively in the treatment of liver problems, according to ancient ayurvedic literature. In contrast to synthetic medications that have not undergone scientific evaluation, the plants have been widely utilised in Ayurveda and other traditional medical systems for the treatment of liver problems. They have also been found to be effective and affordable. Thus, it seemed sense to look into Abutilon's hepatoprotective properties.

Kanghi (H), also known as Abutilon indicum (Linn.) Sweet, is a member of the Malvaceae family. The plant can be found throughout Central India in its natural state. The plant has alkaloids, flavonoids, and saponins. The plant is known to contain significant amounts of β-sitosterol, fumaric acid, p-coumaric acid, vanillic acid, and caffeic acid. The plant's leaves are a source of flavonoids, steroids, and sapogenins. Nearly every portion has therapeutic value and has been traditionally utilised to treat a variety of illnesses. The plant's roots are thought to have demulcent and diuretic properties that help with urethritis and chest infections. The root's infusion is recommended as a cooling remedy for fevers and is said to help with leprosy, strangury, and haematuria. It has been discovered that the leaves can heal liver disease and ulcers. The plant has proven to be used as diuretic, astringent, alexeteric, febrifuge, and anthelmintic properties. The seeds are used to treat gonorrhoea, chronic cystitis, piles, laxatives, and expectorants. [4]

Material and Methods

Collection of herbs and their authentication

The dried stem of the plant were collected from the local area of Madhya Pradesh in August 2023 and was authenticated by the Botanist.. Voucher specimen No. J/Bot./AIS-12 was allotted to the selected plant parts.

Extraction of selected herbs

250 grammes of coarsely powdered Abutilon indicum stem material that had been shade dried was put into a Soxhlet device and extracted for 48 hours using a 90:10 ethanol:water ratio. Evaporation was used to remove the solvent once the extraction process was finished. The rotator evaporator was used to dry the extracts. The residue was then kept in dessicator. [5-6]

Preparation of Herbal Tablet

100 mg of hydroalcoholic extract was taken along with excipients like MCC, Cellulose, Potato starch, Talc, Mg state and Methyl praben and were compressed to get herbal tablet of 250 gm weight and termed as HT.

Hepatoprotective activity

Test Compounds

The HT and standard drug silymarin (50 mg/kg body weight) were used.

Chemicals and Reagents

Paracetamol, Silymarin.

Experimental Animal

Albino rats (200-250 g) used in the present studies was procured. The animals were fed with standard pellet diet (Hindustan lever Ltd. Bangalore) and water *ad libitum*. All the animals were acclimatized for a week before use.

Paracetamol Induced Model

The rats were divided into four groups of 6 animals in each. [8-10]

S/No.	Group	Treatments
1.	Group I (Normal)	Received vehicle gum acacia (5mg/kg p.o) for 7days
2.	Group I (Control)	Received vehicle gum acacia (5 mg/kg p.o) for 7 days once daily and paracetamol 500mg/kg once daily
3.	Group III (Standard)	Received silymarin as standard (50 mg/kg) for 7 days once daily and paracetamol 500mg/kg once daily
4.	Group IV (Treated-HT)	Received HT (250 mg/kg) once daily and paracetamol 500mg/kg once daily

On the seventh day, the blood samples were collected via orbital sinus puncture for the estimation of biochemical marker enzymes and allowed to clot and serum was separated by centrifuge at 2500 rpm for 15 min and analyzed for various biochemical parameters. Then the liver was carefully isolated and cleaned off extraneous tissue and preserved in 10% neutral formalin and then subjected to histopathological studies. [8-10]

Statistical Analysis

All the values ware statistically analyzed by one-way analysis of variance (ANOVA) followed by Dunnette multiple Comparisons test. Statistically significance of * $P<0.01$, ** $P<0.001$, when compared with respective control. All values are expressed 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. [8-10]

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. [8-10]

Results and Discussion

An essential function of the liver is to regulate physiological processes. There are multiple roles involved, such as secretion, metabolism, and storage. Moreover, the liver is where different medications and xenobiotics are detoxified. Among other things, the liver secretes bile, which is vital for digestion. The worst illness is liver disease. The group that received HT treatment nearly brought the raised enzyme levels from the paracetamol-treated group back to normal, according to the results of the biochemical parameters. When compared to the hepatotoxic control at a dose

of 250 mg/kg, the HT containing hydro-alcoholic extracts of the stem of Abutilon indicum showed considerable hepatoprotective effect as they lowered SGPT. The table displays the outcomes of the HT and treatment. The cytosolic enzyme SGPT is mostly found in the liver. When paracetamol causes liver damage, this cellular enzyme leaks plasma, which raises serum SGPT levels. Hepatic necrosis brought on by tissue injury may raise SGPT serum levels. The extract appears to have strong hepatoprotective action because it dramatically lowered SGPT levels. The HT containing hydro-alcoholic 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 were presented in table 1. The histopathology described (Fig. 1) that Architecture is normal: It is normal. The portal triads, sinusoids, and central veins all seem normal. The hepatocytes have round to oval nuclei and considerable amounts of cytoplasm. Periportal inflammation does not exist. When taking 500 mg/kg of paracetamol, the central veins enlarge and get congested. Feathery degeneration is seen in the hepatocytes. The portal triads exhibit a modest lymphocyte-based peri-portal inflammation. Silymarin 50 mg/kg: The veins in the centre seem normal. Feathery degeneration is seen in the hepatocytes. The portal triads exhibit a modest lymphocyte-based peri-portal inflammation. HAEAIS (250 mg/kg): The hepatocytes had substantially enlarged pleomorphic and hyperchromatic nuclei along with moderate amounts of cytoplasm. The portal triads exhibit a modest lymphocyte-based peri-portal inflammation. The veins in the centre are normal.

Table 1: Effect of HT 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**
HT (250 mg/kg)	0.59 ± 4.21*	0.51 ± 0.07*	220.21± 7.29*	101.21± 4.21*	218.20± 8.17*

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 3: Effect HT on liver weight variation of paracetamol induced hepatotoxicity in rats

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**
HT (250 mg/kg)	8.23 ± 0.07*

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.

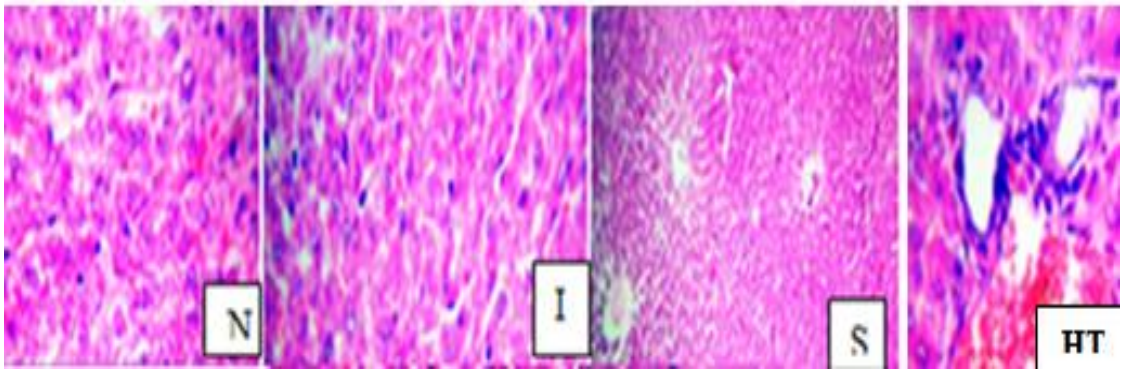

Fig. 1: Histopathologic section of liver of rats in paracetamol induced hepatotoxicity

Conclusion

Liver diseases are a serious and widespread condition. The current study examined the hepatoprotective effects of a herbal tablet containing hydroalcoholic extract of the stem of the medicinal plant Abutilon indicum against toxicity in albino rats treated with paracetamol. The findings indicated that the HT, at a dose of 250 mg/kg, demonstrated a significant hepatoprotective effect in comparison to the hepatotoxic control.

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