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Mangifera Indica Leaves Extract Effect on Liver Function in Experimental Animal Studies

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ABSTRACT

This experimental study was undertaken to see the hepatoprotective activity of ethanol extract of *Mangifera-indica* dried leaves against CCl_4 induced acute liver damage on albino rats. CCl_4 (1ml/kg) significantly elevated the serum levels of biochemical markers like SGPT, SGOT, ALP, Total bilirubin, Protein and depleted antioxidant enzymes GSH upon administration of CCl_4 (1ml/kg) to albino rats. After treatment with *MI leaf Extract* (300mg/kg), *MI leaf Extract* (600mg/kg) for two weeks there is significantly reduced the elevated levels of biochemical markers mentioned above. These results suggest that this *MI leaf Extract* may have the potential therapeutic value in the treatment of CCl_4 induced hepatic damage and some liver diseases. Hepatoprotective activity of this extract may be attributed to the anti-oxidant principles in it.

Keywords: Antioxidant, *MI leaf Extract*, CCl_4, Liver damage, Silymarin, Hepatoprotective.

INTRODUCTION

The liver performs the normal metabolic homeostasis of the body as well as biotransformation, detoxification and excretion of many endogenous and exogenous compounds, including pharmaceutical and environmental chemicals. Drug-induced hepatotoxicity is a major cause of iatrogenic diseases, accounting for one in 600 to one in 3500 of all hospital admissions[1].

Traditional medicine is the sum total of knowledge, skills and practices based on the theories, beliefs and experiences indigenous to different cultures that are used to maintain health as well as to prevent, diagnose, improve or treat physical and mental illnesses. Herbal treatments are the most popular form of traditional medicine. Herbal medicines include herbs, herbal materials, herbal preparations and finished herbal products that contain parts of plants or other plant materials as active ingredients[2]. However, no scientific data regarding the identity and effectiveness of these herbal products were available, except in the treatise of Ayurveda and Unani medicine[3]. The World Health Organization (WHO) has laid emphasis on promoting the use of traditional medicine for health care[3] Hence, we see a focus on research on traditional and herbal medicine, especially in developing countries, with individual as well as collaborative efforts by national research organizations[4]. There is an acute necessity of reliable hepatoprotective drugs in modern medical practice. Plants and natural products have been used traditionally worldwide for the prevention and treatment of liver disease. Scientific research has supported the claims of the medicinal efficacy of several of these herbal compounds, as evidenced from the voluminous work on their hepatoprotective potentials[5]. More than 700 mono- and polyherbal formulations from over a hundred different plants are available for use[6].

In the present study Mango tree leaves were taken to evaluate its hepatoprotective activity for its anti-oxidant property. *Mangifera indica* (MI),

also known as mango, Aam, it has been an important herb in the Ayurvedic and indigenous medical systems for over 4000 years. Mangoes belong to genus*Mangifera* which consists of about 30 species of tropical fruiting trees in the flowering plant family Anacardiaceae. According to Ayurveda, varied medicinal properties are attributed to different parts of mango tree. Mango is one of the most popular of all tropical fruits. Mangiferin, being a polyphenolic antioxidant and a glucosyl xanthone, it has strong antioxidant, anti lipid peroxidation, immunomodulation, cardiotonic, hypotensive, wound healing, antidegenerative and antidiabetic activities[7].

MATERIALS AND METHODS

Collection of plant material

Fresh leaves of *MANGIFERA INDICA* were collected during April-May from Eluru surrounding areas in Andhra Pradesh. The plant medicinal properties were identified and authenticated by Dr.Suman Chandra, PhD., Professor of Pharmacognosy.A.P. The literature was collected from the book- Indian Medicinal Plants by Vaidyaratnam P.S. Varier vol-5(8).

Preparation of Ethanol extract

The dried fine powder of leaves of the *MANGIFERA INDICA* as weighed on balance 40g, and taken into the sac like cloth material and placed in the Soxhlet basket. 400 ml of ethanol was taken as solvent into the Soxhlet flask. Cold tap water must flow through the inlet and outlet of the condenser. The Soxhlet apparatus kept running for 24hours for proper extraction. The extract laden solvent falling from the Soxhlet basket is dark in color and it becomes clearer, that indicates the extraction process is finished. At the end of the extraction process the solvent is then evaporated and the remaining mass is measured[8]. At the end of the extraction procedure, out of 40g of dry powder, I got 7g of remaining mass as extract. (17.5%).

The yield of the ethanol extract is 17.5%. The extract was suspended in 2ml of 2% Gum acacia and used for the oral administration.

Toxicity study

The acute oral toxicity study was conducted according to the OPPTS (office of prevention, pesticide and toxic substances) Up and Down procedure. [(9)]

Chemicals

All the drugs and materials used for this study are of pharmacopeia grade. CCl_4 (E.Merck), Silymarin (sigma) and gum acasia-2%, olive oil, were purchased from the local supplier.

EXPERIMENTAL

Before conducting this study, Institutional Animal Ethical Committee (IAEC) permission was

Table 1: Effect of Mangier Indica leaves Extract on liver function (n=6, Mean±SEM)

Groups(I-IV)	SGOT (IU/ml)	SGPT (IU/ml)	ALP (IU/ml)	Totel Bilirubin -g/100gm bw	Liver Weight (Mg/dl)
Control (CCl_4-1ml/kg)	236.4± 0.40	241.43± 0.32	231.1± 0.25	2.02± 0.02	3.63± 0.02
Standard (Silymarin-100mg/kg)	153.1± 0.11***	151.26± 0.14***	171.2± 0.22***	0.80± 0.04***	2.71± 0.02***
MI leaf Extract Test-1(300mg/kg)	191.5± 0.20**	201.36± 1.14**	220.7± 0.12**	1.76± 3.11***	3.75± 0.01**
MI leaf Extract Test-2(600mg/kg)	186.2± 0.06*	179.41± 3.43*	192.2± 0.11*	1.50± 0.02**	3.23± 0.20*

*P<0.05, **P<0.01, ***P<0.001 compared to Control.

taken. This study was conducted strictly according to CPCSEA guidelines.

The animals used for the experiment were divided into 4 groups and 6 rats for each group. Food was withdrawn 12 hr before CCl_4 administration to enhance the acute liver toxicity in all test groups of animal models[10].

Grouping of Rats

Group-I (control): treated with 2% gum acacia (2ml/100g) Group-II (standard): treated with Silymarin (100mg/kg) Group-III (T-1): treated with *MI leaf Extract* (300 mg/kg/day, orally) Groups- IV (T-2): treated with *MI leaf Extract* (600mg/kg/day, orally)

All the groups were treated with test drugs orally 1 hr prior to CCl_4 administration. After 1 hr of giving test drugs to all group of animal, Hepatic injury was induced by intraperitoneal injection of 1:1 v/v Carbon tetrachloride (CCl_4) in olive oil (1ml/kg) daily for 14 days. On 15th day, all the animals were anesthetized and blood was collected from the carotid artery at the neck for the determination of enzyme levels in serum, then all animals were sacrificed[11].

RESULTS

All the groups (I-IV) of animals were treated with two doses of *MI leaf Extract* 300mg/kg, 600mg/kg for test groups, 2% gumacacia-2ml/100g for control group and Silymarin (100mg/kg) for standard group, 1 hr before giving CCl_4(1ml/kg). The Carvedilol and Silymarin treated animals were shown significant reduction in Serum marker enzymes (*p<0.001). MI leaf Extract* (600mg/kg) and Silymarin (100mg/kg) greatly reduce enzyme levels but *MI leaf Extract* (300mg/kg), has shown less effect than *MI leaf Extract* 600mg/kg and Silymarin but shown better effect than CCl_4 induced hepatotoxicity in control group rats. (12) Liver weight almost comes to normal.

Statistical analysis

The results obtained were expressed as Mean±SEM and were analyzed by the application of One-way Analysis of Variance (ANOVA), and P<0.05 was considered significant. All the results were depicted in below table. Histological examination of the hepatic tissue in CCl_4 treated rats shown that CCl_4 had produced profound inflammation and congestion particularly in sinusoids. Pre-treatment of animals with Silymarin (100mg/kg) and *MI leaf Extract* 300mg, 600mg doses have not shown any pathological changes in histological study.

DISCUSSION

In the present study, this *MI leaf Extract* was selected to prove its anti oxidant effect by hepatoprotective activity scientifically by using experimental animal models. Selection of this plant for this study is due to its antioxidant property. According to Ayurveda, varied medicinal properties are attributed to different parts of mango tree. Mango is one of the most popular of all tropical fruits. Mangiferin, being a polyphenolic antioxidant and a glucosyl xanthone, it has strong antioxidant, anti lipid peroxidation, immunomodulation, cardiotonic, hypotensive, wound healing, antidegenerative and antidiabetic activities[13]. its leaves medicinal properties were not evaluated for its hepatoprotective activities earlier, so this study was undertaken. CCl_4 induced hepatic damage in rats model was used for the study. CCl_4 is commonly used drug to induce hepatotoxicity by generating free radicals in the experimental study[14]. Liver damage was confirmed by high serum enzymes (SGOT, SGPT, ALP and TB) levels because they are cytoplasmic in location and released into circulation after hepatocyte damage. Liver weight also increased due to toxic effect of CCl_4. Due to anti oxidant property of these anti hypertensive drugs were used to inhibit generation of free radicals in hepatotoxicity induced by CCl_4 in rats.

The *MI leaf Extract* 600mg/kg and Silymarin treated animals were shown significant reduction in Serum marker enzymes (*p<0.001). MI leaf Extract* 600mg/kg and Silymarin (100mg/kg) greatly reduce enzyme levels but *MI leaf Extract* 300mg/kg has shown less effect than *MI leaf Extract* 600mg/kg and Silymarin but shown better effect than CCl_4 induced hepatotoxicity in control group rats. Liver weight almost comes to normal[15, 16].

Its probable mechanism in hepato-protective activity was due to its anti oxidant effect by preventing free radical releasing. This plant leaves contain various chemical compounds like Tannins, Saponins, Flavonoids, Terpenoids. These chemical molecules may attributed to its antioxidant property. In histological examination also, no inflammatory cells and very less necrotic cells were appeared with *MI leaf Extract* 600mg/kg treated, Silymarin treated groups. Few inflammatory cells were appeared in *MI leaf Extract* 300mg/kg treated groups. Serum enzymes levels were also comes to normal. The weight of the Liver also in both the models was effectively reduced in high dose of MI extract 600mg/kg and Silymarin treated groups when compared with control group.

CONCLUSION

The present experimental study indicates that the naturally available Mango leaves extract has potential hepatoprotective activity by its anti-oxidant property. So, this extract can be used as anti oxidants in various conditions. But it needs further clinical trials before complete trust and usage.

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