Effect of leaf and Seed Extract of *Tamarindus indica* on liver weight of Rats toxicated with paracetamol: A comparative study

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Abstract

Background: *Tamarindus indica,* known as tentul or imli having therapeutic interest in various liver aliments caused by viruses, hepatotoxic agents. **Objective:** To compare the effect of ethanolic extract of leaf and seed of *Tamarindus indica* on liver weight when liver is toxicated with paracetamol. **Methods:** A total of twenty four Long Evan's rats were collected and divided into four groups. Each group having six rats (n=6). Control group received normal diet ad libitum, only paracetamol group received paracetamol (1500 mg/kg) for 12 days and rest two groups received paracetamol (1500 mg/kg) along with ethanolic extract of seed of *Tamarindus indica* (1250 mg/kg) and leaf extract of Tamarind (1250mg/kg) for 12 days respectively. On 13th day, all rats were sacrificed. Then livers were collected and weighed by an electronic balance. **Results:** In this study, the mean (±SD) liver weight was 4.08±0.23 in control group, 6.27±0.68 in only paracetamol treated group, 5.22±0.72 and 5.10±0.78 in paracetamol along with seed extract of *Tamarindus indica* and leaf extract of Tamarind treated group respectively. **Conclusion:** The present study showed that mean (±SD) weight of liver increased with paracetamol and decreased with seed extract and leaf extract of *Tamarindus indica.*

Key words: Tamarind, ethanolic extract, hepatotoxic agents

Introduction

Liver aliments like hepatitis, cirrhosis, fatty liver are the serious issues worldwide. Liver is the organ of pre-eminent importance. It has important roie in formation of hormone, serum protein, clotting factors, bile, cholesterol, enzymes, maintain homeostasis and detoxification of toxic substances.[1] Viruses, various drugs and chemicals like methyldopa, halothane, paracetamol (PCM), rifampicin, isoniazid, carbon tetrachloride (CCl4), ethanol, thiacetamide etc. can damage and weaken liver cell.[2] Rimonabant, propylthiouracil, corticosteroid, vitamin E are used to treat liver diseases and cause severe side effects with having high cost.[3] Researchers showed that lots of medicinal plants claimed to have liver healing properties with least side effects.[4] Tamarindus indica Linn., a very popular fruit tree belonging to the family Fabacae, subfamily Caesalpinioideae. This evergreen bushy tree is native to tropical Africa and

it's cultivation was widespread, developing well in all tropical countries.[5] Flowers, leaves, seeds, stem, bark, pulp having a variety of bioactive compounds.[6] So it keeps beneficial effects in human health. Tamarind is used traditionally in abdominal pain, wound healing, snake bite, cold, diarrhoea, helminthic infection, fever. It also possesses antibacterial, antidiabetic, antifungal, anti-inflammatory, antimalarial, antioxidant and hepatoprotective activities.[7] Studies have shown that Tamarindus indica contain flavonoid, ascorbic acid and beta-carotene. These compounds are responsible for reducing liver weight which is increased by hepatotoxic agents.[8,9]

The present study was chosen to measure the effect of ethanolic extract of seed and leaf of Tamarindus indica on liver weight where liver was toxicated with paracetamol and thus evaluate comparative efficacy of hepatoprotection between extracts.

Materials and methods

(a) Drugs and Chemicals

Paracetamol was obtained as powder form from kumudini pharmaceuticals Ltd., Bangladesh. Propylene glycol, a solvent for paracetamol powder and Vitamin E solution was collected from Drug International Ltd., Bangladesh.

(b) Collection of Plant Materials

The seeds and fresh leaves of Tamarindus indica were collected from Sirajgonj and authenticated by plant taxonomy unit of Bangladesh National Herbarium with accession no. DACB-35524, which was preserved to the Herbarium.

(c) Preparation of Plant Extract

The seeds and leaves were shade dried and pulverized into fine particles by electric grinder machine. The powders were kept in a airtight plastic container. Then they were immersed in 95% ethanol. The extract so obtained was condensed at 40-50oc until a paste was formed in a vacuum rotatory evaporator. Extract paste was freeze dried. Then they were kept in the refrigerator for further use. All procedures were performed in laboratory of Pharmacology and Microbiology department in BSMMU.

(d)Animals

A total of twenty four Long Evan's rats (150-180gm) were used for this study. The rats were collected from ICDDR'B. They were kept in a well ventilated room in the animal house of Dhaka Medical College. A 12 hour light/12hour dark cycle was maintained. They were allowed free access to food and water ad libitum. Ethical clearance for the use of animals was obtained from the committee constituted for the purpose.

(e) Intervention

A total of twenty four rats were taken and organized into four groups randomly. Each group consisted of six rats (n=6). Control group received normal diet ad libitum. Only Paracetamol group received paracetamol (1500mg/kg) for 12 days and another two groups received paracetamol (1500mg/kg) along with ethanolic extract of seed of Tamarindus indica (1250mg/kg) and leaf extract of Tamarind (1250mg/kg) for 12 days respectively.

(f) Collection of liver

After 24 hours of last treatment, all rats were anesthetized with light chloroform and sacrificed. Then livers were separated and cleared with water, dried with tissue paper. They were properly weighed by an electronic balance. Then they were fixed in 10% formalin.

(g) Statistical Analysis

The liver weight of the rates were expressed in mean ±SD. Student's 't' test was applied to Compare the liver weight of the rats between the different groups. $P<0.05$ was considering as significant.

Results

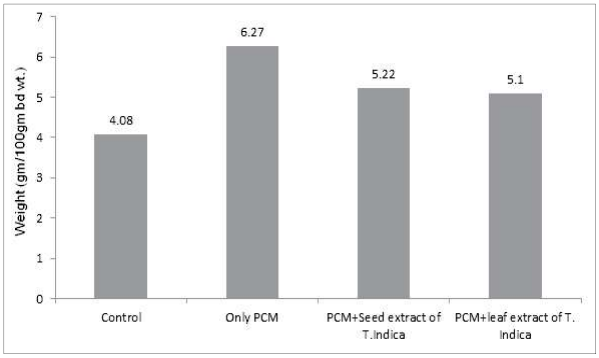
In this study, the mean (±SD) liver weight was 4.08±0.23 in control group, 6.27±0.68 in only paracetamol group, 5.22±0.72 and 5.10±0.78 in paracetamol along with seed and leaf extract of Tamarindus indica treated group respectively [Table-I]. In rats treated with only paracetamol, liver weight increased significantly as compared to control group. Significant decrease in liver weight was observed following administration of ethanolic extract of seed of Tamarindus indica and leaf extract along with paracetamol, which was close to normal. There was no significant difference between seed extract and leaf extract of Tamarindus indica [Table-II].

Table-I: Liver weight of rat of different groups

Groups	Mean (±SD) ofLiver weight (gm/100gm body weight)
Control	4.08±0.23
Only Paracetamol (1500 mg/kg)	6.27±0.68
Paracetamol (1500 mg/kg)+ seed extract T. indica(1250 mg/kg)	5.22±0.72
Paracetamol (1500mg/kg)+leaf extract T.indica(1250 mg/kg)	5.10±0.78

Table-II: Comparison of liver weight of rat of different groups

Groups	P value	Level of significance
Control vs Only Paracetamol	P<0.001***	Highly significant
Control vs PCM with T.indica seed extract	P>0.1	Not significant
Control vs PCM with leaf extract T.indica	P>0.1	Not significant
Only Paracetamol vs PCM with T. indica seed extract	P<0.05	Significant
Only Paracetamol vs PCM with T.indica leaf extract	P<0.01	Significant
PCM with T.indica seed extract vs PCM withT.indica leaf extract	P>0.1	Not significant



Different groups of rat

Figure: Bar diagram showing mean (± SD) liver weight of different groups of rat.

Discussion

In this study, paracetamol intoxicated group gained liver weight. Seed and leaf extract of Tamarindus indica reduce increased liver weight of rat. There was no difference in effectiveness between leaf and seed extract of tamarind. These findings are in agreement with previous work on various extracts against paracetamol toxicity.[8,9,10,11]

Paracetamol is a common over the counter drug used as antipyretic and analgesic. It is safe at therapeutic dose but overdose can cause liver damage. This drug is largely metabolized in liver and excreted by kidney after conjugation with sulphate and glucuronide. Toxic effect on liver with paracetamol linked to creation of hazardous metabolites when a small percentage of paracetamol (5-10%) is converted by cytochrome p450 into a reactive metabolite, N-acetyl-parabenzo-quinone imine (NAPQI), that is related to paracetamol hepatotoxicity. This toxic metabolites have the ability to alkylate and oxidize intracellular glutathione (GSH), resulting in liver damage. GSH depletion enhances lipid peroxidation by extracting hydrogen from a [polyunsaturated fatty acid. Glutathion, one of the tripeptide and non enzymatic biological antioxidants. It helps to remove free radical. Liver enzymes are

released from cells as a result of hepatocyte necrosis or aberrant membrane permeability.[3] Tamarind seed extract rich in procyanidin that inhibits the burst of oxidation in the liver.[12] Seed and leaf extract also contain several polyphenolic compounds, flavonoid that provides antioxidant activity.[13,14] Therefore, it reduces inflammation of cells, fatty changes.

Paracetamol overdose increase liver weight due to cellular swelling with massive necrosis and inflammatory infiltrate.[10] Seed and leaf extract restore cellular architecture of liver and abnormal liver weight was normalized.

Conclusion

In view of undesirable side effects of synthetic drugs there is growing interest in evaluating herbal medicines. Extracts of medicinal plants discover a new compounds. In this study equal quantities of leaf and seed extract of *Tamarindus indica* showed same efficacy against liver damage. Further studies should be carried out to get a new formulation from these extracts which will be a new era in medical sciences.

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