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A Review of Indian Medicinal Plants with Hepatoprotective Activity

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ABSTRACT –

In recent years, natural plant-based products have drawn a lot of attention because of their many pharmacological characteristics, such as hepatoprotective and antioxidant effects. The liver is an essential organ that handles digestion, metabolism, and detoxification. Many herbs have long been utilized in the ancient medical system known as Ayurveda to promote liver function, guard against injury, and improve detoxification. This review examines important Ayurvedic herbs, including Pomegranate (*Punica granatum*), Karonda (Carissa Carandas), Kokam (*Garcinia indica),* Guava *(Pisidium guajava)*. These herbs support liver function and offer protection against diseases including cirrhosis, hepatitis, and fatty liver by having anti-inflammatory, detoxifying, and antioxidant properties. The medicinal value of these herbs is influenced by their bioactive components, which include flavonoids, alkaloids, and glycosides, etc.

Key word – Hepatoprotective activity, liver, herbal plants**,** liver detoxification.

Introduction

Herbal medicine has been used since 2100 BC in India during the Vedic era and in ancient China during the Xia dynasty. The Charaka Samhita of India, which dates to 600 BC, contains the earliest recorded accounts. These medical systems emphasize on medication that can balance these energies and preserve good health because they believe that disease is a symptom of a general imbalance of the dichotomous energies that control life in general and human life specifically.

According to Indian Ayurveda, the forces are ama (weakness, illness, and intoxication) and agni (strength, health, and inventiveness).The main claim made by all of these Indian medical systems is that their pharmaceutical concoctions have the ability to treat a variety of liver disorders. (1)

Since ancient times, herbal medications have been utilized to treat liver problems; this practice dates back to Eastern medicine.As scientific research advances and demonstrates the value of herbal therapeutic practices in disease diagnosis, treatment, and prevention, herbs are becoming increasingly widely used.

The liver, which makes up around 2% of the average person's body weight, is the largest organ in the body. It is linked to the majority of physiological functions, such as immunity, growth, nutrition, energy metabolism, and reproduction. The primary effectors of the humoral branch of the immune system, bile, albumin, prothrombin, and complement, are synthesized and excreted mostly in the liver. (2)

Globally, chronic liver illnesses pose a significant health burden; in Western nations, liver cirrhosis ranks as the ninth most common cause of death.

The key conditions that still have a lot of unanswered questions are hepatocellular carcinoma, alcoholic liver disease, non-alcoholic fatty liver disease, chronic viral hepatitis B and C and also some toxic substance.

For common liver illnesses such cirrhosis, fatty liver, and chronic hepatitis, there are typically few effective treatment options, a risk of side effects, and high costs, particularly for developing nations.

Active ingredients for the treatment of a variety of illnesses are compounds with distinct structures but the same therapeutic activity that have been identified from different plant species.

Numerous phytomolecules derived from different plant sources, such as flavonoids, alkaloids, glycosides, and saponins, have been shown to be effective hepatoprotective agents.

There are several different molecules having antioxidant action in plant tissues.

The primary antioxidants found in herbal medications are flavonoids and phenolic chemicals.

Because of their reactivity as hydrogen or electron-donating agents and metal ion chelating qualities, the phenolic compounds demonstrate notable free radical scavenging capabilities. (3)

Liver diseases may be prevented or treated with herbal medicines produced from a variety of herbs because of their synergistic action.

These remedies are made up of an intricate blend of various chemical ingredients.(4)

There are list of herbal plant which are used in treatment of liver diseases or hepatoprotection.

1. **Pomegranate (*Punica granatum*)**

Scientific classification	
Kingdom:	Plantae
Clade	Tracheophytes
Order	Myratles
Family	Lythraceae
Genus	Punica
Species	*P. Granatum*

Common name – pomegranate

The pomegranate originated in a region that stretches from northern India to present-day Iran.

Properties – It is rich in antioxidant of polyphenolic class which includes tannins and flavonoids.
Inhibition of free radical induced damage by supplementation of antioxidants has become an attractive therapeutic strategy for reducing the risk of diseases. (5)

Fig.1- Punica granatum (Punicaceae)

2. Karonda (Carissa Carandas)

Scientific Classification	
Kingdom	Plantae
Clade	Tracheophytes
Order	Gentianales
Family	Apocynaceae
Genus	Carissa
Species	*C. carandas*

Common name- Karonda

Most commonly found in India, Pakistan, Myanmar, Afghanistan, Nepal, Sri Lanka, and Malaysia, it is widely spread throughout South Asia.

Properties - It can lower lipid peroxidation, bilirubin, and serum marker enzyme activity. (6)

Fig.2- Carissa carandas

3. **Kokam (*Garcinia indica)***

Scientific Classification	
Kingdom	Plantae
Clade:	Tracheophytes
Order:	Malpighiales
Family	Clusiaceae
Genus	Garcinia
Species	*G. indica*

Common name –karonda

Most commonly found in India, Pakistan, Myanmar, Afghanistan, Nepal, Sri Lanka, and Malaysia, it is widely spread throughout South Asia.

Properties- It has antioxidative, free radical scavenging properties.

Inhibition of lipid peroxidation and the augmentation of endogenous antioxidants in the liver. (7)

Fig.3- Garcinia indica

4. Guava (Pisidium guajava)

Scientific Classification	
Kingdom	Plantae
Clade	Tracheophytes
Order	Myrtales
Family	Myrtaceae
Genus	*Psidium*
Species	*P. guajava*

Common name – Guava

The guava is indigenous to tropical America, where it grows naturally. In India, it was first used in the seventeenth century.

Properties - antioxidant activity and ability to reduce serum enzyme activity.

Fig.4- Psidium guajava

Material method

1. Plant

Punica granatum Pomegranate L. Peels were bought in dry form from a spice vendor in the Cairo neighborhood market. (8)

In April 2007, the roots of C. carandas were gathered from Udupi, Karnataka. It was verified by Dr. Gopalakrishna Bhat of Poorna Prajna College's Botany Department in Udupi, Karnataka, India.

Carbon tetrachloride (CCl4):

CCl4 (carbon tetrachloride) in a 10% liquid blend. utilized as a poisonous substance for liver toxicity, per Passmore & Eastwood (1986).

Rats & Diet:

Thirty mature male albino rats (Sprague-Dawley strain) weighing 120±5 g and aged 8–12 weeks. The AIN-93 formula for the basal diet (Reeves et al., 1993). In the diet, 2%, 4%, and 6% of the pomegranate powder plant was included.

Elaboration of plant formulations:

In accordance with Russo (2001), who stated that plants are best preserved in a dark, dry position to reduce oxidation of their components, plant materials were ground into a powder and stored in dim, sealed glass bottles (in a dry location) until they were needed.

Experimental design

30 male albino rats weighing 120±5 were kept in clean, well-ventilated cages at 25±3°C. Throughout the six weeks of the study, food and water were freely available. The NRC (1995) outlined the basic diet, which included 50 g/kg of maize oil, 200 g/kg of casein, 30 g/kg of cellulose, 3 g/kg of DL-methionine, 497 g/kg of corn starch, 100 g/kg of mineral mixture, 20 g/kg of vitamin mixture, and 100 g/kg of sucrose. Prior to the trial, rats were given a week to acclimate. Rats were split up into five major groups of six each following adaption.

Group (1) Negative control group (fed a foundational diet).

Group (2) was fed a baseline diet and served as the positive control group (+ve).

Groups 3, 4, and 5 were given a basic diet for 28 days along with pomegranate powder at rates of 2, 4, and 4 g/kg/diet/day, respectively.

CCL4 (2 ml/b.w/rats), which had been previously diluted in liquid paraffin oil 1:1, was given intraperitoneally into groups 2–5 on day 29 of the experiment to cause hepatic and other potential side effects as the rats' renal diseases were then sacrificed 24 hours later.

Rats were anesthetized and fasted before being sacrificed at the conclusion of the experiment (29 days). Samples of blood were drawn, allowed to coagulate, and then centrifuged.

The serum was properly aspirated and then frozen until it was time for analysis.

2. Plant

In April 2007, the roots of C. carandas were gathered from Udupi, Karnataka. It was verified by Dr. Gopalakrishna Bhat of Poorna Prajna College's Botany Department in Udupi, Karnataka, India. (9)

Carbon tetrachloride (CCl4):

Purchase carbon tetrachloride (CCl4) from E. Merck (India) Ltd. in Mumbai.

Experimental animal

The Wistar albino rats used in the trials were of either sex and weighed between 150 and 180 g. The animals were kept in regular settings with a 12-hour light/dark cycle, 25°C, 45–60% relative humidity, and standard rat diet (Kamadenu Agencies, Bangalore, India) and unlimited water. Before the experiment started, all of the animals were given a week to get used to the lab environment. Before the experiment began, the Institutional Animal Ethical Committee (IAEC) examined and approved all experimental methods, and laboratory animal care was conducted in accordance with CPCSEA guidelines.

Wistar albino rats were split into six groups of six animals each at random.

Group I: A single daily dosage of normal saline (5 ml/kg, po) was given to the normal control group.

Group II, the CCl4 control group, received a single daily dosage of CCl4/olive oil (1:1 v/v, 0.7 ml/kg, ip) and normal saline (5 ml/kg, po) on alternate days for seven days.

Group III, the control group, received CCl4/olive oil (1:1 v/v, 0.7 ml/kg, ip) and silymarin (25 mg/kg, po) once daily on alternate days for seven days.

Groups IV, V, and VI received a single daily dosage of CCl4/olive oil (1:1 v/v, 0.7 ml/kg, ip) and ERCC (100, 200, and 400 mg/kg, po, respectively) on alternate days for seven days.

3. Plant

The rind of the G. indica fruit was gathered from Maharashtra's Konkan region; air dried in the shade, mechanically ground into a powder, and then sealed in an airtight container.(10)

Experimental animal

Wistar albino rats of either sex weighing 150–200 g were employed.They were kept in hygienic polypropylene cages with standard humidity levels of 50±5%, temperatures of 25±2 °C, and light levels of 12 hours of light and 12 hours of dark. They were also given a standard diet of Amrut laboratory animal feed, Pune, India, and unlimited water. Every animal was treated with compassion. The Institutional Animal Ethics Committee (Animal House Registration No.25/1999/CPCSEA) examined and approved the experimental methods, which adhere to the Indian National Science Academy's Guidelines for the Use and Care of Experimental Animals in Research.

Group I, which acted as the standard control, was given distilled water orally once every day for 28 days.

Group II was given ethanol (5 g/kg, 20% w/v p.o.) once daily for 21 days, from day 8 to day 28, acting as a toxicant control.

Group III, known as GIE400, was given ethanol (5 g/kg, 20% w/v p.o.) daily for 21 days from day 8 to day 28 and GIE (400 mg/kg, p.o.) daily for 28 days.

Group IV, known as GIE800, was given ethanol (5 g/kg, 20% w/v p.o.) daily for 21 days from day 8 to day 28 and GIE (800 mg/kg, p.o.) daily for 28 days.

Group V was administered ethanol (5 g/kg, 20% w/v p.o.) every day for 21 days, from day 8 to day 28, and silymarin (200 mg/kg, p.o.) for 28 days.

4. Plant

Fresh P. guajava leaves were gathered in November from Bangalore's Koramangala neighborhood.(11)

Experimental animal

Acute toxicity from carbon tetrachloride (CCl4): Prior to delivery, CCl4 was diluted 1:1 with liquid parafiin. Five groups of six animals each were formed from the animals. After that, the animals received one of the subsequent treatments for a period of nine days.

Group 1: distilled water (1 ml/kg, po)

Group 2: CCl4 (1 ml/kg, po) on day nine after nine days of distilled water

Group 3: 100 mg/kg po daily for nine days of silymarin with 1 ml/kg po of CCl4 on the ninth day

Group 4: CCl4 (1 ml/kg, po) on day 9 after receiving PGJ (250 mg/kg/day, po) for nine days

Group 5: 500 mg/kg/day, po of PGJ for nine days plus 1 ml/kg, po of CCl4 on the ninth day

Conclusion

Hepatoprotective herbs are essential for controlling and avoiding liver damage brought on by oxidative stress, medications, alcohol, and pollutants. The phytochemical composition of several therapeutic plants, including flavonoids, tannins, polyphenols, and alkaloids, has shown notable hepatoprotective properties. Examples of these include Psidium guajava, Garcinia indica, and Carissa carandas. These bioactive substances help repair liver function and stop hepatocellular damage by having detoxifying, anti-inflammatory, and antioxidant qualities.

Traditional herbal treatment presents a viable substitute or adjunctive strategy for managing liver health.

In conclusion the treatment of liver illness could benefit greatly from the use of hepatoprotective plants, and further study could help realize their full therapeutic potential for human health.

Peels from pomegranates (Punica granatum L.) are a great source of antioxidants that promote health and have a hepatoprotective effect against toxicity caused by CCL4 in rats.

The levels of serum marker enzymes such as SGOT, SGPT, and SALP content in mice intoxicated with CCl4 were significantly higher.

The total bilirubin level significantly increased whereas the uric acid and total protein content significantly decreased in the CCl4-treated groups.

CCl4-intoxicated animals showed a substantial decrease in GSH, SOD, and CAT activities and a marked increase in MDA content.

Good hepatoprotective action was demonstrated by the Psidium guajava leaf aqueous extract.

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