ABSTRACT
Liver is a vital organ that plays an important role in metabolism and excretion of xenobiotics from the body. Liver injury or liver dysfunction is a major health problem that challenges not only health care professionals but also the pharmaceutical industry. Liver cell injury caused by various toxic chemicals (certain analgesic, chemotherapeutic agents, carbon tetrachloride (CCl₄), thioacetamide (TAA) etc.), excessive alcohol consumption and microbes is well studied. The available synthetic drugs to treat liver disorders in this condition also cause further damage in the liver. Hence herbal drugs have become increasingly popular and their use is widespread in the world. Herbal medicines have been used in the treatment of liver diseases for a long time. Number of herbal preparations is available in the market. The present review is aimed to comparing data on promising phytochemical from medicinal plants that have been tested in hepatotoxicity models using modern scientific system.


INTRODUCTION
Herbal medicines have recently attracted much attention as alternative medicines useful for treating or preventing lifestyle-related disorders and relatively very little knowledge is available about their mode of action. There had been a growing interest in the analysis of plant products which has stimulated intense research on their potential health benefits.¹
Many medicinal plants traditionally used for thousands of years are present in a group of herbal preparations of the Indian traditional health care system (Ayurveda) and proposed for their interesting multiple activities. Amongst the medicinal plants used in Ayurvedic preparations for their therapeutic action some have been thoroughly investigated and some of still to be explored.[2]

It is estimated that about 7,500 plants are used in local health traditions in mostly rural and tribal villages of India. Out of these real medicinal value of over 4,000 plants is either little known or unknown to the mainstream population. The classical systems of medicine such as Ayurveda, Siddha, Unani and Tibetan use about 1,200 plants[3]

*Pisonia aculeata* (Nyctaginaceae) is nearly pantropical found throughout the new world tropics and is considered introduced in Africa, Asia, and the Phillipines[4] *Pisonia aculeata* is a large scandent shrub distributed throughout India. The leaves and bark are used by the tribes and native medical practitioners to treat various ailments including liver disorders, inflammation, swelling, cough and tumours[5] Preliminary phytochemical screening of the extracts reveals the presence of alkaloids, phenolic compounds, tannins, saponins and flavonoids.

**SCIENTIFIC CLASSIFICATION**

Table.1 scientific classification of plant *Pisonia aculeata* Linn.

<table>
<thead>
<tr>
<th>RANK</th>
<th>SCIENTIFIC NAME</th>
<th>COMMON NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kingdom</td>
<td>Plantae</td>
<td>Plants</td>
</tr>
<tr>
<td>Subkingdom</td>
<td>Tracheobionta</td>
<td>Vascular plants</td>
</tr>
<tr>
<td>Super division</td>
<td>Spermatophyta</td>
<td>Seed plants</td>
</tr>
<tr>
<td>Division</td>
<td>Magnoliophyta</td>
<td>Flowering plants</td>
</tr>
<tr>
<td>Class</td>
<td>Magnoliopsida</td>
<td>Dicotyledons</td>
</tr>
<tr>
<td>Subclass</td>
<td>Caryophyllidae</td>
<td>-</td>
</tr>
<tr>
<td>Order</td>
<td>Caryophyllales</td>
<td>-</td>
</tr>
<tr>
<td>Family</td>
<td>Nyctaginaceae</td>
<td>– Four o’clock family</td>
</tr>
</tbody>
</table>

**DISTRIBUTION AND ECOLOGY**

Altitudinal range from near sea level to 750 m. Grows in monsoon forest and the drier more seasonal lowland and upland rain forests. Also occurs in the Americas, Africa, India, Burma, Indochina, Taiwan, Malesia and the Pacific islands. Plant Pisonia aculeata native of Central America & also grows in South America, Asia, Africa, Pacific Islands & Australia. This plant in the summer assumes a white colouring; it is medium in size and can reach 5 m high. It keeps its leaves in the winter. The Pisonia aculeata develops like a shrub This plant in the
summer assumes a white colouring it is medium in size and can reach 5 m high. It keeps its leaves in the winter.

**BOTANICAL DESCRIPTION**

Much branched bush, with curved spines; leaves commonly elliptic-oval variable in shape 2.5-15 cm long 1.5-6 wide inflorescence in cymes 2-6 cm wide fruit cymes up to 10 cm fruit pedicels up to 16 mm male perianth broadly bell-shaped 2-4 mm with wide lobes stamens commonly 6 very exerted female perianth 2-3 mm fruit claviform 9-12 mm long, 3-4 mm wide with five corners each with row of glands. STEM Vine stem diameters to 16 cm recorded. Short thorny branches sometimes persist on the lower stem. Blaze odour difficult to describe. LEAVES recurved thorns 5-7 mm long frequently produced on leafy twigs. Leaf blades about 2.5-12 x 5-5.5 cm petioles about 0.5-3 cm long. Lateral branches subtend an angle of about 90 to the main stem. FLOWERS technically peduncles resemble pedicels. Perianth about 2.5-3 mm diam. Stamens seven or eight per flower filaments about 4-5 mm long. Ovary about 0.7 mm long. Style about 1-1.5 mm long. Stigma fimbriate at the apex. Fruits about 10-15 x 4 mm on a stalk about 9 mm long. Outer surface of the fruit clothed in fine longitudinal stripes of glandular projections. Fruits adhere to clothing. Seeds spindle-shaped, about 9-13x 2.5-3 mm. Testa thin Embryo about as long as the seed Radicle about 3 mm long. Seedlings Cotyledons unequal on each seedling, one cotyledon much larger than the other. Cotyledons ovate to broadly cordate, about 15-30 x 12-24 mm. Cotyledonary midrib raised on the upper surface. Hypocotyl hairy the hairs multicellular curved and reddish. First leaf blades elliptic apex bluntly pointed base cuneate to attenuate underside clothed in small hairs. At the tenth leaf stage leaf blade elliptic apex acuminate base cuneate to attenuate. Midrib red raised on the upper surface. Lateral veins forming loops inside the margin of the leaf blade. All plant parts clothed in multicellular hairs the upper surface of the leaf blade sparsely clothed. Spines up to 10 mm long may be present in some leaf axils.

**REGIONAL NAMES**

Table 2 Regional name of plant *Pisonia aculeata* Linn distributed in India.

<table>
<thead>
<tr>
<th>REGIONAL NAME</th>
<th>TRADITIONAL NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRULA</td>
<td>Ottu Chedi</td>
</tr>
<tr>
<td>MALAYALAM</td>
<td>Karindhu, Kodimullaram</td>
</tr>
<tr>
<td>TAMIL</td>
<td>Kodi kuttipadatthi, Marukalli, selamaranjaan</td>
</tr>
<tr>
<td>OTHERS</td>
<td>Murukkaali, Karindu, Muruvilikkodi</td>
</tr>
</tbody>
</table>
DIFFERENT VARITIES OF PISONIA GENUS

*Pisonia grandis* br.

*Pisonia albida* Britton

*Pisonia ambigua* Heimerl

*Pisonia capitata* Standl

*Pisonia flavescens* Standl

*Pisonia floribunda* Hook

*Pisonia grandis* R. Br

*Pisonia macranthocarpa* Donn.Sm

*Pisonia pedicellaris* Heimerl

*Pisonia umbellifera* Seem

*Pisonia zapallo* Griseb

MEDICINAL PROPERTIES AND USES

*Pisonia aculeata* Linn. is a large scandent shrub which holds an important place in folklore medicine. The leaves and bark are used by the tribes and native medical practitioners to treat various ailments including- Liver disorders, Inflammation, swelling Cough & Tumours.

ACTIVE COMPOUND

Main constituent present in the plant are Flavonoids and some other constituent Saponins, Terpenoids, and polyphenolic compounds.

FLAVONOIDS

Flavonoids are polyphenolic compounds that are ubiquitous in nature and are categorized according to chemical structure into flavonols, flavones, flavanones, isoflavones, catechins, and chalcones. Over 4,000 flavonoids have been identified many of which occur in fruits, vegetables and beverages (tea, coffee, beer, wine and fruit drinks). The flavonoids have used considerable interest recently because of their potential beneficial effects on human health they have been reported to have antiviral, anti allergic, anti platelet, anti inflammatory, antitumor and antioxidant activities.

Antioxidant flavonoids (listed in order of decreasing potency)

- Quercetin (a flavonol in vegetables, fruits, onions)
• Xanthohumol (a prenylated chalcone in hops and beer)

• Isoxanthohumol (a prenylated flavanone in hops and beer)
• Genistein (an isoflavone in soy)

![Genistein](image)

Pro oxidant flavonoids
• Chalconaringenin (a nonprenylated chalcone in citrus fruits)

![Chalconaringenin](image)

• Naringenin (a nonprenylated flavanone in citrus fruits)

![Naringenin](image)

**PHARMACOLOGY OF FLAVONOIDS**
Flavonoids have been reported to exert wide range of biological activities. These includes: anti-inflammatory, antibacterial, antiviral, ant allergic, cytotoxic antitumour, treatment of neurodegenerative diseases, vasodilatory action. In addition flavonoids are known to inhibit lipid-peroxidation, platelet aggregation, capillary permeability and fragility, cyclo-oxygenase
and lipoxygenase enzyme activities. They exert these effects as antioxidants free radical scavenger’s chelators of divalent cation. These are also reported to inhibit variety of enzymes like hydrolyses, hyalouronidase, alkaline phosphatase, arylsulphatase, cAMP phosphodiesterase, lipase, α-glycosidase, kinase.

**Effect of flavonoids in treatment of hepatotoxicity**

**Role of flavonoids in treatment of hepatotoxicity:** Flavonoids bind to subunit of DNA-dependent RNA polymerase thus activating the enzyme. As a result, protein synthesis gets increased leading to regeneration and production of Hepatocytes.

**SAPONINS**

Saponins are glucosidase with foaming characteristics. Saponins consist of a polycyclic aglycones attached to one or more sugar side chains. The aglycone part, which is also called sapogenin is either steroid (C27) or a triterpenes (C30). The foaming ability of saponins is caused by the combination of a hydrophobic (fat-soluble) sapogenin and a hydrophilic (water-soluble) sugar part. Saponins have a bitter taste. Some saponins are toxic and are known as sapotoxin.

**HEALTH BENEFITS OF SAPONINS**

Saponins have many health benefits. Studies have illustrated the beneficial effects on blood cholesterol levels, cancer, bone health and stimulation of the immune system. Most scientific studies investigate the effect of saponins from specific plant sources and the results cannot be applied to other saponins.

**CHOLESTEROL REDUCTION**

Saponins bind with bile salt and cholesterol in the intestinal tract. Bile salts form small micelles with cholesterol facilitating its absorption. Saponins cause a reduction of blood cholesterol by preventing its re-absorption.

**REDUCE CANCER RISK**

Studies have shown that saponins have antitumor and anti-mutagenic activities and should lower the risk of human cancers by preventing cancer cells from growing. Saponins seem to react with the cholesterol rich membranes of cancer cells thereby limiting their growth and viability Roa and colleagues found that saponins may help to prevent colon cancer.
IMMUNITY BOOSTER
Plants produce saponins to fight infections by parasites. When ingested by humans saponins also seem to help our immune system and to protect against viruses and bacteria.

ANTIOXIDANT
The non-sugar part of saponins have also a direct antioxidant activity which may results in other benefits such as reduced risk of cancer and heart diseases.

TERPENOIDS
Terpenoids and terpenes are aromatic compounds that are found in thousands of plant species and are responsible for the various flavours and fragrances of cannabis. We have known about their presence in cannabis for decades but it is only recently that awareness of their potential therapeutic properties has begun to expand.

PHARMACOLOGICAL ACTIVITIES
ANTI DIABETIC AGENT PINNITOL FROM THE LEAVES OF PISONIA ACULEATA[13]
Reported the phytochemical investigation of the leaves Pisonia aculeata has been reported to contain several secondary metabolites like flavonoids, coumarins flavones, steroids and triterpenoids.[11] First one is Pinnitol an anti-diabetic compound Allantoin and hydrogen bonded isomeric crystalline form (Allantoin).

![Fig.1.Pinnitol](image)

WOUND HEALING ACTIVITY[14]
Reported the wound healing potential of methanolic extract of Pisonia aculeata leaves. The extract was incorporated in simple ointment base and evaluated using two types of wound model in Wistar rats-excision wound and incision wound. The results were significantly different (p<0.05) when compared with control group for wound contraction, tensile strength, histopathological and biological parameters. Antibacterial studies against different bacterial
strains of the test samples were performed by the disk diffusion method and were compared with standard Ofloxacin and Erythromycin. Test samples showed comparable zone of inhibition to the standards. It is hypothesized that the presence of phytoconstituents with the antibacterial effect helps in wound healing.

**ANTI INFLAMMATORY ACTIVITY**[16]

Reported the anti inflammatory activity on both aqueous and alcoholic extract of *Pisonia aculeata* leaves in carageenan induced paw edema rats. Preliminary phytochemical screening was performed for both the extracts. This study showed vital information regarding pharmacological and phytochemical activities of *Pisonia aculeata*.

**CARCINOMA TUMOR ACTIVITY**[17]

The antitumor properties of the extract may due to these compounds. The present study points to the potential anticancer activity of *Pisonia aculeata* in a dose dependent manner and might be a promising chemotherapeutic agent against murine tumors. The antitumor effect of the extract was evaluated by using survival time, hematological parameters, and increase in body weight, solid tumor volume and peritoneal cell count.

**ACKNOWLEDGEMENT**

Authors are thankful to the Director, CSIR-National Botanical Research Institute, Lucknow for providing necessary support. Two of the authors, LA and SSG are grateful to Department of Science & Technology (DST), Ministry of Science and Technology, New Delhi for providing DST-INSPIRE fellowship.

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