A Comprehensive Review on Phytochemistry, Pharmacological Activities and Therapeutic Potential of *Pisonia aculeata Linn.*

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Abstract:- ***Pisonia aculeata Linn*** **is a well-known medicinal plant belonging to the family Nyctaginaceae and has been widely used in traditional systems of medicine for many years.** ***Pisonia aculeata Linn*** **is commonly used in traditional medicines due to its various therapeutic values. Traditionally, leaves, roots and stems of the plant are used as natural remedies for different diseases such as inflammations, pain, ulcers, diabetes, infections, fever and wounds. The wide scope of medical uses of** ***Pisonia aculeata Linn*** **has caught the attention of researchers and scientists involved in field of pharmacognosy and herbal medicine. Phytochemical analysis of** ***Pisonia aculeata Linn*** **has confirmed the presence of different biologically active secondary metabolites including alkaloids, flavonoids, tannins, phenolic compounds, glycosides, steroids and saponins. It is believed that these phytoconstituents are responsible for various biological activities observed in this plant. Various scientific studies conducted on** ***Pisonia aculeataLinn*** **showed that the extracts obtained from the plant had antioxidant, antimicrobial, anti-inflammatory, analgesic, antidiabetic, hepatoprotective and anticancer effects. Antioxidant activity of this plant prevents oxidative stress and protects cell against free radical damages. With growing interest in discovering medicinal plants as an alternative source for drug discovery,** ***Pisonia aculeata Linn*** **is considered to have high pharmaceutical significance.**

Keywords:- *Pisonia aculeata Linn*, Ethnomedicinal uses, Antioxidant potential, Phytomedicine, Therapeutic potential.

I. INTRODUCTION

The use of plants to treat diseases has been practiced since the ancient period. The significance of medicinal plants lies in their effectiveness and safety in treating diseases. Apart from being effective and safe, they are affordable. Hence, a considerable number of people across the globe still rely on herbal drugs for treatment. In recent years, many scientific studies have been conducted to evaluate the effectiveness and safety of traditional uses of medicinal plants [1]. *Pisonia aculeata Linn*., which belongs to the Nyctaginaceae family, is one of those plants with great medicinal value. It is a large scandent shrub and is highly valued in folk medicine. Many scientific studies have been carried out to justify the medicinal value of the plant. It has exhibited significant biological activity like anti-inflammatory, analgesic, antioxidant, and hepatoprotective actions, supporting its

traditional applications [1,2]. Moreover, it has shown antitumor and anticancer effects due to the biological activity of the methanolic extract of the plant [3]. Besides, the presence of certain bioactive substances such as flavonoids and the phytochemical analysis of *Pisonia aculeata Linn* has shown that various significant phytochemicals such as flavonoids, alkaloids, phenols, tannins, and glycosides have been identified in this plant. The presence of these chemicals explains the wide range of pharmacological effects associated with this herb [4]. This suggests the significance of this plant as a source of novel drugs. Therefore, it can be concluded that *Pisonia aculeata Linn*. is one of those plants whose traditional uses have been scientifically validated.chromones has accounted for the antitubercular activity of the plant [5].

II. PLANT DESCRIPTION

Pisonia aculeata Linn is a perennial climbing shrub with woody nature that belongs to the family Nyctaginaceae. The plant species have wide distribution in the tropical and subtropical regions and can be found growing in the forests, hedges, wastelands, and coastal lands. The plant is medically important and finds applications in many forms of herbal medicine. This thorny climber has long and branched stems, which become woody in older plants. Stems of young plants are green and soft in nature, whereas those of matured plants become woody and hard. The branches of this plant bear sharp curved spines, which helps the plant in climbing on other vegetations as well as acts as a protective mechanism[6]. In terms of morphology, the leaves of this species are simple, opposite, petiolate and have ovate to elliptical shape. They are green, smooth, glabrous in nature, and their edges are entire with an acute apex. The flower is small in size and greenish-white or yellowish in color, and they usually occur in clusters or cymes. The flower is mildly scented and can either be male or female. It usually flowers under warm climatic conditions[6,7].Fruits of the plant are elongated and sticky in nature and have glandular hairs covering them. Due to their sticky nature, fruits can easily adhere to the bodies of animals and birds, thus aiding in dispersal. The seeds of *Pisonia aculeata Linn* are small in size and found inside the fruit. Tap root system is well developed in the plant. Roots are also traditionally known for their medicinal value. *Pisonia aculeata Linn* is rich in phytoconstituents like alkaloids, flavonoids, tannins, phenolics, glycosides, steroids, and saponins [8].

III. SCIENTIFIC CLASSIFICATION

Origin: -Mexico; West Indies; Central America; South America; Asia; Africa;Pacific Islands, Australia.
Plant Name: - Pisonia Aculeata
Other Name: - pull-back-and-hold, Digki
Common Name: - zarza, zarza espinosa.
Tamil Name: - Milagu
Kingdom: - Plantae
Division: - Angiosperms
Order: -Caryophyllales
Family: -Nyctaginaceae
Sub Family: - Nyctaginaceae
Genus: -Pisonia[18,20]
Species: - P. Aculeata [19,20]
Habitat: -Central America; South America; Asia; Africa; Pacific Islands,Australia.
Cultivation:- This plant in the summer assumes a white colouring; it is medium insize and can reach 5 m high. It keeps its leaves in the winter. The *Pisonia aculeata Linn* 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.

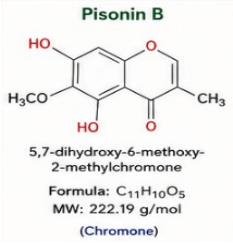
Medicinal Uses:- *Pisonia aculeata Linn*. is a large scandent shrub, which holds an important place in folklore medicine. It is extensively used by native medical practitioners and tribes. Diseases treating swelling, rheumatic pains, jaundice and tumors.

IV. PROFILE OF PHYTOCONSTITUENTS

The phytochemical composition of *Pisonia aculeata Linn* plays a significant role in its therapeutic potential and pharmacological activities. Medicinal plants contain a wide variety of bioactive compounds, including alkaloids, flavonoids, phenolic compounds, terpenoids, glycosides, and steroids, which contribute to their medicinal properties. Identification and characterization of these phytoconstituents are essential for understanding their biological activities and possible pharmaceutical applications. The following information presents the major phytoconstituents reported from *Pisonia aculeata Linn*, along with their molecular formula, chemical structure, class of metabolites, and associated therapeutic uses [9-11].

- **Pisonin A-**
  - Molecular formula: - $C_{12}H_{12}O_5$
  - Molecular weight: - 236.22 g/mol
  - Type of metabolite: - Chromone (secondary metabolite)
  - Chemical structure: -5,7-dihydroxy-6-methoxy-2,2-dimethylchromone
  - Primary biological activity: - Antitubercular activity
  - Therapeutic use: -Tuberculosis treatment

- **Pisonin B-**
  - Molecular formula: -$C_{11}H_{10}O_5$
  - Molecular weight: -222.19 g/mol
  - Type of metabolite: - Chromone (secondary metabolite)
  - Chemical structure: -5,7-dihydroxy-6-methoxy-2-methylchromone
  - Primary biological activity: -Antitubercular activity
  - Therapeutic use: - Tuberculosis treatment



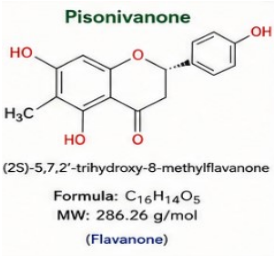
- **Pisonin C-**
  - Molecular formula: - $C_{12}H_{12}O_6$
  - Molecular weight: -252.22 g/mol
  - Type of metabolite: - Chromone (secondary metabolite)
  - Chemical structure: -5,7-dihydroxy-6-methoxy-2-(1-hydroxy-1-methyl) chromone
  - Primary biological activity: - Antitubercular activity
  - Therapeutic use: -Tuberculosis treatment

- **Pisonin D-**
  - Molecular formula: - $C_{11}H_8O_4$
  - Molecular weight: -204.18 g/mol
  - Type of metabolite: - Chromone (secondary metabolite)
  - Chemical structure: -5,7-dihydroxy-2-methylchromone
  - Primary biological activity: - Antitubercular activity
  - Therapeutic use: - Tuberculosis treatment

- **Pisonin E-**
  - Molecular formula: - $C_{12}H_{10}O_5$
  - Molecular weight: - 234.20 g/mol
  - Type of metabolite: - Chromone (secondary metabolite)
  - Chemical structure: - 5,7-dihydroxy-6-methoxy-2-ethenylchromone
  - Primary biological activity: - Antitubercular activity
  - Therapeutic use: -Tuberculosis treatment

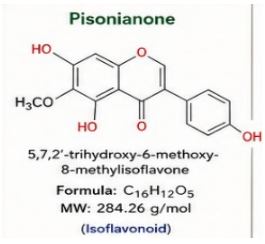
- **Pisonin F-**
  - Molecular formula: - $C_{12}H_{10}O_6$
  - Molecular weight: - 250.20 g/mol
  - Type of metabolite: - Chromone (secondary metabolite)
  - Chemical structure: - 5,7-dihydroxy-6-methoxy-2-(hydroxymethyl)chromone
  - Primary biological activity: -Antitubercular activity
  - Therapeutic use: -Tuberculosis treatment

- **Pisonivanone-**
  - Molecular formula: - $C_{16}H_{14}O_5$
  - Molecular weight: -286.26 g/mol
  - Type of metabolite: -Flavanone (secondary metabolite)
  - Chemical structure: - (2S)-5,7,2'-trihydroxy-8-methylflavanone
  - Primary biological activity: - Antitubercular and antioxidant activity
  - Therapeutic use: - Tuberculosis and oxidative stress

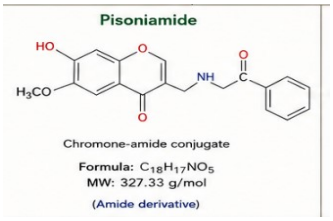


- **Pisonivanol-**
  - Molecular formula: - $C_{17}H_{16}O_6$
  - Molecular weight: - 316.30 g/mol
  - Type of metabolite: - Flavanone (secondary metabolite)
  - Chemical structure: - (2R,3R)-3,7-dihydroxy-5,6-dimethoxyflavanone
  - Primary biological activity: - Antioxidant and potential antitubercular activity
  - Therapeutic use: -Oxidative stress management

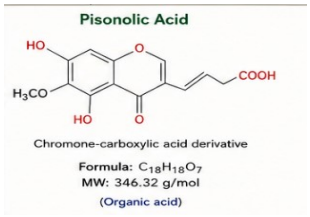
- **Pisonianone-**
  - Molecular formula: - $C_{16}H_{12}O_5$
  - Molecular weight: - 284.26 g/mol
  - Type of metabolite: - Isoflavonoid (secondary metabolite)
  - Chemical structure: - 5,7,2'-trihydroxy-6-methoxy-8-methylisoflavone
  - Primary biological activity: - Antitubercular activity
  - Therapeutic use: - Tuberculosis treatment



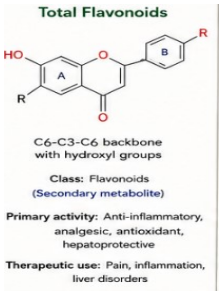
- **Pisoniamide-**
  - Molecular formula: - $C_{18}H_{17}NO_5$
  - Molecular weight: -327.33 g/mol
  - Type of metabolite: - Amide derivative (secondary metabolite)
  - Chemical structure: -Chromone-amide conjugate
  - Primary biological activity: - Antimicrobial and antitubercular activity
  - Therapeutic use: - Infectious diseases



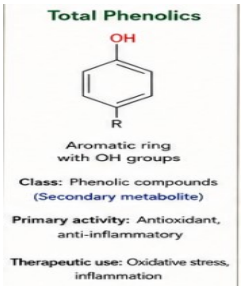
- **Pisonolic Acid-**
  - Molecular formula:- $C_{18}H_{18}O_7$
  - Molecular weight:- 346.32 g/mol
  - Type of metabolite:- Organic acid (secondary metabolite)
  - Chemical structure:- Chromone-carboxylic acid derivative
  - Primary biological activity:- Antioxidant and anti-inflammatory activity
  - Therapeutic use: - Inflammation and oxidative stress



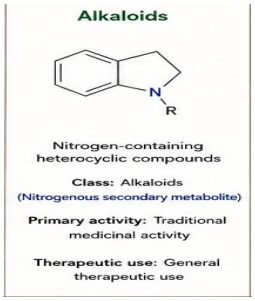
- **Total Flavonoids-**
  - Molecular formula: -Variable
  - Molecular weight: - Not specified
  - Type of metabolite: - Flavonoids (secondary metabolites)
  - Chemical structure: - C6-C3-C6 backbone with hydroxyl groups
  - Primary biological activity: - Anti-inflammatory, analgesic, antioxidant, hepatoprotective
  - Therapeutic use: - Pain, inflammation, and liver disorders



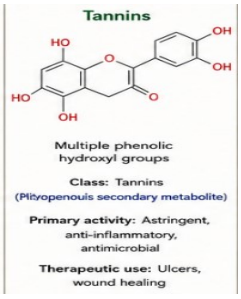
- **Total Phenolics-**
  - Molecular formula: - Variable (mixture)
  - Molecular weight: - Not specified
  - Type of metabolite: - Phenolic compounds (secondary metabolites)
  - Chemical structure: - Aromatic ring containing hydroxyl groups
  - Primary biological activity: - Antioxidant and anti-inflammatory activity
  - Therapeutic use: -Oxidative stress and inflammation



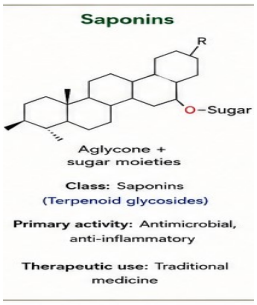
- **Alkaloid-**
  - Molecular formula: -Variable
  - Molecular weight: -Not specified
  - Type of metabolite: -Alkaloids (nitrogenous secondary metabolites)
  - Chemical structure: -Nitrogen-containing heterocyclic compounds
  - Primary biological activity: -Traditional medicinal activity
  - Therapeutic use: -General therapeutic applications



- **Tannins-**
  - Molecular formula: -Variable (polymeric compounds)
  - Molecular weight: -Not specified
  - Type of metabolite: -Tannins (polyphenolic secondary metabolites)
  - Chemical structure: -Multiple phenolic hydroxyl groups
  - Primary biological activity: -Astringent, anti-inflammatory, and antimicrobial activity
  - Therapeutic use: -Ulcers and wound healing

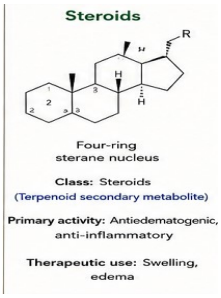


- **Saponins-**
  - Molecular formula: -Variable (glycosides)
  - Molecular weight: -Not specified
  - Type of metabolite: - Saponins (terpenoid glycosides)
  - Chemical structure: -Aglycone linked with sugar moieties
  - Primary biological activity: -Antimicrobial and anti-inflammatory activity
  - Therapeutic use: -Traditional medicinal applications



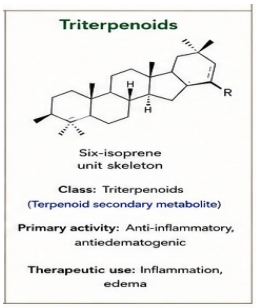
- **Steroids-**
  - Molecular formula: -C_{27}–C_{30}
  - Molecular weight: -Approximately 300–450 g/mol

- Type of metabolite: -Steroids (terpenoid secondary metabolites)
- Chemical structure: -Four-ring sterane nucleus
- Primary biological activity: -Antiedematogenic and anti-inflammatory activity
- Therapeutic use:- Swelling and edema



➢ **Triterpenoids-**

- Molecular formula: -$C_{30}H_{50}$
- Molecular weight: -410.72 g/mol
- Type of metabolite: -Triterpenoids (terpenoid secondary metabolites)
- Chemical structure: -Six-isoprene unit skeleton
- Primary biological activity: -Anti-inflammatory and antiedematogenic activity
- Therapeutic use: -Inflammation and edema



V. ETNOMEDICINAL AND MODERN THERAPEUTIC APPLICATIONS OF PISSONIA ACULEATA LINN

The therapeutic potential of *Pisonia aculeata Linn* is mainly attributed to the presence of diverse bioactive phytoconstituents that exhibit significant pharmacological activities. Traditionally, the plant has been used in folk and Ayurvedic medicine for the management of inflammation, infections, pain, wounds, and other ailments. Recent pharmacological investigations have further validated many of these traditional claims by identifying compounds with antitubercular, antioxidant, anti-inflammatory, antimicrobial, hepatoprotective, and antiedematogenic properties. The following table summarizes the major phytoconstituents reported from *Pisonia aculeata Linn*, along with their pharmacological activities, traditional medicinal uses, and current therapeutic applications [12].

Table no. 1Ethnomedical Profile of *Pisonia Aculeata Linn* Constituents

Phytoconstituent	Pharmacological Activity	Traditional applications	Current Therapeutic applications
Pisonin A	Antitubercular	Used in traditional herbal remedies for respiratory infections	Tuberculosis treatment research
Pisonin B	Antitubercular	Traditional management of infectious diseases	Potential antitubercular agent
Pisonin C	Antitubercular	Folk medicine for pulmonary disorders	Tuberculosis treatment studies
Pisonin D	Antitubercular	Traditional treatment of chronic infections	Antitubercular therapeutic application

Pisonin E	Antitubercular	Used in herbal medicine for microbial infections	Investigated for tuberculosis management
Pisonin F	Antitubercular	Traditional respiratory ailment therapy	Potential anti-TB compound
Pisonivanone	Antioxidant, antitubercular	Used for fever and inflammatory conditions	Oxidative stress and tuberculosis management
Pisonivanol	Antioxidant	Traditional rejuvenating and protective remedy	Antioxidant therapy and supportive treatment
Pisonianone	Antitubercular	Used in folk medicine against infections	Tuberculosis treatment research
Pisoniamide	Antimicrobial, antitubercular	Traditional remedy for infectious diseases	Antimicrobial and anti-TB applications
Pisonolic acid	Anti-inflammatory, antioxidant	Used to relieve swelling and pain	Inflammation and oxidative stress treatment
Total flavonoids	Anti-inflammatory, analgesic, hepatoprotective	Traditional use in pain and liver disorders	Management of inflammation and hepatoprotection
Total phenolics	Antioxidant, anti-inflammatory	Used in traditional healing preparations	Oxidative stress and inflammatory disorders
Alkaloids	General medicinal activity	Widely used in indigenous medicine systems	Potential therapeutic and pharmaceutical applications
Tannins	Astringent, antimicrobial, anti-inflammatory	Used in wound healing and ulcer treatment	Ulcer management and antimicrobial therapy
Saponins	Antimicrobial, anti-inflammatory	Used in traditional medicinal formulations	Anti-inflammatory and antimicrobial applications
Steroids	Antiedematogenic, anti-inflammatory	Used to reduce swelling and body pain	Edemaand inflammatory condition management
Triterpenoids	Anti-inflammatory, antiedematogenic	Traditional remedy for inflammation	Treatment of edema and inflammatory disorders

VI. DISEASE BASED PHARMACOLOGICAL POTENTIAL OF *PISONIA ACULEATA LINN*

The table below talks *about Pisonia aculeata Linn*and its role in diseases and disorders. It is really important to know what causes these diseases and how they work. This is because it helps us understand how medicinal plants like *Pisonia aculeataLinn* can be useful. *Pisonia aculeata Linn* has a lot of things in it that can help our body. It has things that can stop cells from getting damaged reduce swelling fight off germs protect our liver and do other good things.The table gives us a look at what diseases *Pisoni*a *aculeata Linn*can help with and how it can help. It also tells us about the things that happen in our body when we get these diseases. This helps us see how *Pisonia aculeata Linn*can help us feel better and stop us from getting sick. *Pisonia aculeata Linn*can play a role, in managing and preventing diseases [13-16].

Table No. 2 Disease Based Pharmacological Potential of *Pisonia Aculeata Linn*

Diseases	Etiology	Pathophysiology	Role Of Pisonia Aculeata Linn
Inflammatory Disorders	Caused by infection, injury, autoimmune reactions, or tissue irritation.	Inflammation occurs due to release of inflammatory mediators such as prostaglandins, histamine, cytokines, and leukotrienes, leading to redness, pain, swelling, and heat.	The plant possesses anti-inflammatory phytochemicals like flavonoids and phenolics which may help reduce inflammatory mediator activity.
Oxidative Disorders	Caused by excessive production of free radicals due to pollution, stress,	Excess reactive oxygen species damage lipids, proteins, and DNA, resulting in cellular injury and tissue	Antioxidant compounds present in the plant help neutralize free radicals and protect cells from oxidative

	aging, smoking, or poor diet.	degeneration.	damage.
Microbial Infections	Caused by bacteria, fungi, viruses, or parasites entering the body.	Microorganisms invade tissues, multiply rapidly, and produce toxins leading to tissue damage and immune response activation.	Extracts of Pisonia aculeata have shown antimicrobial activity against certain pathogenic microorganisms.
Diabetes Mellitus	Mainly caused by insulin deficiency or insulin resistance associated with genetic and lifestyle factors.	Impaired glucose metabolism leads to persistent hyperglycemia, oxidative stress, vascular damage, and metabolic disturbances.	The plant is traditionally believed to help regulate blood glucose levels because of its antioxidant and bioactive constituents.
Hepatic Disorders	Caused by alcohol abuse, viral infections, toxins, drugs, and metabolic disorders.	Liver cells undergo inflammation, oxidative stress, and necrosis, impairing detoxification and metabolic functions.	Hepatoprotective phytochemicals may help protect hepatocytes from toxin-induced damage.
Cancer	Triggered by genetic mutations, carcinogens, radiation, chronic inflammation, and oxidative stress.	Abnormal uncontrolled cell division leads to tumor formation, invasion, and metastasis. Oxidative stress and DNA damage play major roles.	Antioxidant and cytoprotective compounds in the plant are being investigated for possible anticancer potential.
Pain	Pain may arise due to injury, inflammation, nerve damage, or infection.	Tissue injury stimulates pain receptors and inflammatory mediators which transmit pain signals through the nervous system.	The plant exhibits analgesic activity that may help reduce pain perception and inflammatory discomfort.

VII. CURRENT RESEARCH & TREATMENT

Pisonia aculeata Linn is getting a lot of attention lately. This is because it has many medicinal properties and people have used it for medicine for a long time. Researchers are studying the plant to see if it can help with inflammation fight off microbes reduce pain and treat tuberculosis. Even though it's not widely used yet studies suggest that *Pisonia aculeata Linn* has a lot of potential for making medicines and herbal remedies [17]. One area of research is looking at how *Pisonia aculeata Linn* can help with inflammation and pain. Some studies on the plants leaf extracts showed that it can really help reduce inflammation and pain in animals.The plant has flavonoids, phenolic compounds and alkaloids which are believed to make it work. *Pisonia aculeata Linn*also seems to have properties, which could help with disorders caused by too much oxidative stress. Another area of research is looking at how *Pisonia aculeataLinn*can fight off microbes and treat tuberculosis. Scientists found some compounds in the plants stem and root that can help fight off Mycobacterium tuberculosis. This has made researchers interested, in using *Pisonia aculeata Linn* to make antimicrobial agents and new medicines. *Pisonia aculeata Linn*might be a source of new treatments.The plant has lots of things in it like saponins and tannins and glycosides and flavonoids and terpenoids and phenolic compounds [18]. These things are being looked at to see how they can help with healing wounds and protecting the liver and helping the system. People are still trying to find out more about the plant to see if they can find better things to use as medicine. People have been using parts of the plant for a long time to help with things like rheumatism and joint pain and inflammation and skin problems and swelling and stomach problems. In some places people put leaf paste and special teas on their skin to help with inflammation. They drink herbal tea to help with problems, inside their body. Most of the time people are just using the plant because it has been used that way for a long time and we need to do more studies to see if it really works [19].

The plant has the potential to be made into lots of herbal medicines, including:

- ✓ Capsules and tablets

- ✓ Herbal extracts
- ✓ Topical gels and creams
- ✓ Ointments for inflammatory conditions
- ✓ Herbal oils
- ✓ Decoctions and syrups
- ✓ Antioxidant herbal formulations

These dosage forms are mainly suggested based on the properties seen in lab studies. Herbal cosmetic products with plant extracts in antioxidants may become a key area of development because people want skincare products made from plants. The research on *Pisonia aculeataLinn* is promising [20]. It still needs a lot of studies on its safetytests on people and methods to make sure it is the same every timeand development of its formulations before it can be widely accepted in the pharmaceutical industry.*Pisonia aculeataLinn*may become a source of natural therapeutic agents in herbal medicine and cosmetic science, with more research [21-22].

VIII. MARKET SCENARIO

Dosage Forms of *Pisonia aculeata Linn* in the market is not yet widely available as a medicine.However, you can find it in herbal and traditional forms, through Ayurvedic practitioners and small herbal suppliers.These forms are often marketed as supplements or traditional remedies[23-25].
Here are some common dosage forms of *Pisonia aculeataLinn:*

- ✓ Herbal supplements
- ✓ Traditional remedies
- ✓ Raw herbal materials

Table No. 3 Market Scenario of Dosage Forms

DOSAGE FORM	DESCRIPTION	MARKET USE
Leaf Decoction (Kwath)	Prepared by boiling fresh or dried leaves in water.	Traditionally used for inflammation, digestive disorders, and joint pain in Ayurvedic and folk medicine practices.
Herbal Powder (Churna)	Dried plant parts are powdered into fine form	Used in traditional herbal formulations and polyherbal preparations.
Capsules	Herbal extract filled into hard gelatin or vegetarian capsules.	Limited availability in herbal supplement markets and experimental formulations.
Tincture	Concentrated alcoholic or hydroalcoholic extract of the plant.	Used in herbal medicine preparations for therapeutic applications.
Topical Paste	Fresh leaf paste applied externally on affected area.	Commonly used in folk medicine for wounds, swelling, skin diseases, and inflammation.
Medicated Oil	Plant extract incorporated into oils such as sesame or coconut oil.	Applied externally for joint pain, massage therapy, and skin disorders.
Ointments and Creams	Semi-solid dosage forms containing plant extract.	Potential use in anti-inflammatory and wound-healing herbal formulations.
Herbal Tonics	Liquid oral formulations prepared using plant extract.	Proposed for future herbal therapeutic preparations and wellness products.
Granules	Dry granulated herbal extract for oral administration.	Used by herbal raw-material manufacturers for formulation development.
Standardized Extracts	Concentrated extracts with defined phytochemical content.	Utilized in research, herbal industries, and formulation development.

IX. ADVANTAGES OF *PISSONIA ACULEATA LINN* OVER THE CONVENTIONAL ALLOPETHIC REMIDIES

There are several reasons why *Pisonia aculeata Linn* is better than conventional drugs when it comes to treating chronic diseases. With its different phytoconstituents, the plant exerts antioxidant, anti-inflammatory, analgesic, hepatoprotective, and antidiabetic properties with minimal side effects. Moreover, it utilizes various mechanism

of action, which makes it ideal for dealing with chronic medical conditions. In addition, its affordability, natural origin, and cultural acceptance make it an accessible therapeutic option in traditional and integrative medicine systems [26-27].

Table no.4 Advantages of *Pisonia aculeata Linn* Over Allopathic Drugs

Advantage	Description
Reduced Side Effects	Shows anti-inflammatory, analgesic, and hepatoprotective activities with comparatively lower toxicity than many synthetic drugs.
Multi-Target Action	Contains flavonoids, alkaloids, tannins, phenolics, and saponins that act on multiple pathways simultaneously.
Cost-Effective	Easily available and affordable, especially beneficial for rural and low-resource communities.
Strong Antioxidant Activity	Rich in phenolic and flavonoid compounds that help reduce oxidative stress and free radical damage.
Suitable for Chronic Diseases	May be useful for long-term management of conditions like diabetes, arthritis, and liver disorders due to lower toxicity.
Better Cultural Acceptance	Widely accepted in traditional healthcare systems, improving patient trust and treatment adherence.

X. FUTURE PROSPECTIVE

There is a need for further scientific investigations concerning *Pisonia aculeata Linn*in view of its promising future in the field of medical research. Researches aimed at isolating active compounds from the plant may be of particular interest. In order to find out its mechanisms of action, advanced biochemical methods should be applied. Since there is not much data on the use of the plant in clinical settings, it would be necessary to conduct appropriate clinical trials and toxicity evaluation. This way, one would be able to define safe and effective ways of using the plant in medical practice. It would also be interesting to explore the possibility of developing herbal medicines from the plant. Besides, the plant's anticancer and immunomodulatory properties may be worth investigating.

XI. DISCUSSION

Pisonia aculeata Linn is a medicinal plant known for its multiple medicinal properties. This plant harbors several phytoconstituents including flavonoids, alkaloids, tannins, terpenoids, steroids, and phenolic compounds that impart the pharmacological activities to it. It has been observed in scientific studies that theyexist antioxidant, anti-inflammatory, antimicrobial, antidiabetic, analgesic, hepatoprotective, wound healing, and cytotoxic properties among others.The ability of the plant to provide antioxidant action can be helpful in lowering oxidative stress that leads to many chronic disorders like diabetes, cancer, and cardiovascular diseases. Its anti-inflammatory and analgesic actions make the plant useful in treating pain, arthritis, and other inflammatory diseases. Antimicrobial activity is also present which shows potential of the plant in combating bacterial and fungal infections. Antidiabetic property is another pharmacological action identified from the experiments on Pisonia aculeata.Although the above-mentioned properties of *Pisonia aculeata Linn* are promising, most of them have only been tested on laboratory animals. Clinical and toxicological studies are yet to be performed properly on the plant. Thus, future studies are required for better understanding of medicinal value of this plant.

XII. CONCLUSION

The plant *Pisonia aculeata Linn* is a potent medicinal plant having different medicinal applications due to its diverse phytoconstituent content and biological activity profile. Various parts of the plant have been employed in the treatment of inflammatory conditions, pain, injuries, diabetic condition, infectious diseases, and liver disease. Some of the major bioactive phytoconstituents found in the plant include flavonoids, alkaloids, tannins, terpenoids, and phenolic compounds that exhibit antioxidant, anti-inflammatory, antimicrobial, antidiabetic, hepatoprotective, and wound-healing effects.Several studies performed by various scientists have shown the validity of some of its traditional uses. Most of the published data on the plant include laboratory and animal study results; therefore, further studies involving clinical trial procedures, toxicology assessments, and standardization of herbal drug preparations must be carried out to establish the efficacy and safety of the plant in humans.In conclusion, *Pisonia aculeata Linn*seems to have tremendous possibilities of becoming a vital medicinal plant of the future in terms of developing pharmaceutical drugs.

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REFERENCE

[1]. Anbarasu C, Raj Kapoor B, Bhat KS, Giridharan J, et al. Protective effect of Pisonia aculeata on thioacetamide-induced hepatotoxicity in rats. Asian Pac J Trop Biomed. 2012;2(1):1–5.
[2].Benita N, Vilvest J, Yagoo A, Vaishnika AM. Larvicidal and pupicidal activities of Pisonia alba leaf extracts against Aedes aegypti supported by GC-MS analysis and molecular docking. J Basic Appl Sci. 2025;14(1):1–10.
[3].Wu MC, Peng CF, Chen IS, Tsai IL. Antitubercular chromones and flavonoids from Pisonia aculeata. J Nat Prod. 2011;74(5):16.
[4].Priya S, Subhashini A. Phytochemical screening and GC-MS analysis of methanolic extract of leaves of Pisonia aculeata Linn. Int J Pharma Bio Sci. 2016;7(2):1–5.
[5].Gupta V, Azmi L, Gupta SS, Verma P, Paswan S, et al. Pisonia aculeata: a herbal drug, godsend for liver dysfunction. 2015;1–5.
[6].Kirtikar KR, Basu BD. *Indian Medicinal Plants*. 2nd ed. Dehradun: International Book Distributors; 2006.
[7].Nadkarni KM. *Indian Materia Medica*. 3rd ed. Mumbai: Popular Prakashan; 2005.
[8].Royal Botanic Gardens Kew. *Pisonia aculeata* L. Plants of the World Online [Internet]. Available from: Kew Science POWO.
[9]. Ghode SP, Chatur MVM, Chaudhari SR, et al. DNA binding study of methanolic extract of Pisonia aculeata Linn. having anticancer activity. Int J Pharm Sci. 2018;10(3):1–5.
[10].Ghode SP, Ghode PD, Chatur VM, Kolhe R. Isolation and characterization of active constituents from Pisonia aculeata Linn. by spectral analysis. Int J Pharmacogn. 2021;8(2):1-6.
[11]. Ghode SP, Raj Kapoor B, Subbraju T. Antitumor activity of methanolic extract of Pisonia aculeata leaf. Int J Pharm Sci Res. 2011;2(4):1–5.
[12].Sen S, Chakraborty R, Rekha B, Revathi D. Anti-inflammatory, analgesic, and antioxidant activities of Pisonia aculeata: folk medicinal use to scientific approach. Pharm Biol. 2013;51(5):1–7.
[13].Halliwell B, Gutteridge JMC. Free Radicals in Biology and Medicine. 5th ed. Oxford: Oxford University Press; 2015.
[14].Kumar V, Abbas AK, Aster JC. Robbins and Cotran Pathologic Basis of Disease. 10th ed. Philadelphia (PA): Elsevier; 2020.
[15].Chen SL, Yu H, Luo HM, Wu Q, Li CF, Steinmetz A. Conservation and sustainable use of medicinal plants: problems, progress, and prospects. Chin Med. 2016; 11:37.
[16].Vandresen F, de Arruda LLM, Rocha BA, et al. Acute toxicity and antiedematogenic activity from stems of Pisonia aculeata L. (Nyctaginaceae). Rev Bras Farmacogn. 2013;23(4):1–6. c potential.
[17].Pisonia aculeata. Ayurwiki [Internet]. Available from: Ayurwiki [accessed 2026 May 21].
[18].De Oliveira AP, et al. Acute toxicity and antiedematogenic activity of the stems of *Pisonia aculeata* L. Rev Latinoam Quim. 2013;41(2):74–82.
[19].Medicinal and aromatic crops: cultivation, benefits and opportunities. India Farm [Internet]. Available from: IndiaFarm
[20].Kala CP. Medicinal plants conservation and enterprise development. Med Plants. 2015;7(2):83–91.
[21].Asian medicinal plants' production and utilization potentials: a review. Sustainability. 2019;11(19):5483.
[22].Cultivation of medicinal and aromatic plants in India—A commercial approach. Acta Hortic. 2002; 576:261–268.
[23].Ask Ayurveda. Pisonia aculeata – Ayurvedic Uses, Benefits & Botanical Profile. Available from: https://ask-ayurveda.com/wiki/article/5404-pisonia-aculeata [accessed 2026 May 21]
[24].Bionial Lifesciences. Ayurvedic Contract Manufacturing India | AYUSH GMP. Available from: https://bioniallife.com/dosage-forms/ayurvedic/ [accessed 2026 May 21].
[25].NJP Healthcare. Pluchea lanceolata. Available from: https://njphealthcare.com/product/pluchea-lanceolata/ [accessed 2026 May 21].

[26].Ask Ayurveda. Pisonia grandis – Ayurveda Uses, Benefits & Medicinal Value. Available from: https://ask-ayurveda.com/wiki/article/5405-pisonia-grandis [accessed 2026 May 21].
[27].Ask Ayurveda. Inula racemosa Hook – Paushkara | Ayurvedic Medicinal Herb. Available from: https://ask-ayurveda.com/wiki/article/4689-inula-racemosa-hook--paushkara-elicampane [accessed 2026 May 21].