



**INTERNATIONAL JOURNAL OF
PHARMACEUTICAL SCIENCES**
[ISSN: 0975-4725; CODEN(USA): IJPS00]
Journal Homepage: <https://www.ijpsjournal.com>



Review Article

A Comprehensive Review on *Abutilon indicum* (Linn.): Pharmacological and Phytochemical Insights

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ARTICLE INFO

Published: 24 Sept. 2025

Keywords:

Abutilon Indicum, Plant,
Phytoconstituents,
Pharmacology, Topical Uses

DOI:

10.5281/zenodo.17189636

ABSTRACT

Abutilon indicum (Linn.) Sweet, commonly known as Indian mallow, is a medicinal shrub belonging to the Malvaceae family. It is widely utilized in traditional medicinal systems such as Ayurveda, Siddha, and Unani. Various parts of the plant, including the leaves, roots, seeds, and flowers, are employed in the treatment of diverse ailments like inflammation, diabetes, respiratory disorders, wounds, piles, and liver-related conditions. It is also used as a demulcent, diuretic, and expectorant. Modern pharmacological research has validated several of these ethnomedicinal claims, reporting antidiabetic, anti-inflammatory, hepatoprotective, antimicrobial, analgesic, and antioxidant properties. Phytochemical investigations have revealed the presence of bioactive compounds such as flavonoids, alkaloids, saponins, tannins, and glycosides, which contribute to its therapeutic potential. Studies on its pharmacological actions have demonstrated promising results both in vitro and in vivo, supporting its role as a candidate for drug development. Despite its wide traditional usage, further clinical studies and toxicological evaluations are essential to confirm its safety and efficacy in humans. This review compiles comprehensive data on the plant's taxonomy, morphology, ethnomedicinal applications, phytochemical constituents, pharmacological properties, and toxicity profile, and highlights future prospects for its development as a natural therapeutic agent.

INTRODUCTION

The research on plant-based medicine has been a foundation of human healthcare systems for

centuries. ^[1] With increasing global interest in natural and holistic treatment options, medicinal plants are being re-evaluated for their pharmacological potential and therapeutic value.

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Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.



[2] The World Health Organization (WHO) estimates that approximately 80% of the world's population still relies on traditional herbal remedies as part of their primary healthcare. [3] This growing reliance is not only rooted in cultural heritage but also in the increasing recognition of the biological efficacy and fewer side effects associated with herbal medicines compared to synthetic pharmaceuticals. [4] *Abutilon indicum* (Linn.) Sweet, a medicinal plant commonly known in Ayurvedic scriptures as Indian mallow or "Atibala" belonging to the Malvaceae family. It is widely distributed throughout the tropical and subtropical regions of Asia, Africa, and the Indian subcontinent. [5] The plant grows abundantly in dry waste lands, roadsides, and open scrub forests and is frequently found as a weed in agricultural fields. Despite its common occurrence, *A. indicum* holds a revered status in ethnomedicine due to its versatile therapeutic applications. [6] In Indian traditional systems of medicine such as Ayurveda, Siddha, and Unani, *Abutilon indicum* is used extensively for the treatment of a wide range of ailments. Ancient Ayurvedic texts describe the plant under the name "Atibala," indicating its use in rejuvenation therapies, wound healing, and for conditions such as respiratory disorders, inflammation, and joint pain. In folk medicine, different parts of the plant—roots, leaves, flowers, and seeds—are used in various preparations like decoctions, pastes, and powders to manage common ailments such as fever, cough, urinary tract infections, and skin diseases. [7] Recent scientific studies have supported many of these traditional claims, attributing the medicinal value of *A. indicum* to its rich phytochemical composition. Compounds such as flavonoids, alkaloids, sterols, saponins, and phenolic acids have been identified, which confer antioxidant, anti-inflammatory, antimicrobial, hepatoprotective, and antidiabetic properties. [8] These findings make *A. indicum* a promising

candidate for drug discovery and pharmaceutical development.

Plant profile:

Table 1: Plant Profile

Common name	Country mallow, Indian mallow
Synonym	<i>Sida indica</i> L.,
Botanical name	<i>Abutilon indicum</i> (L) Sweet
Family	Malvaceae

Vernacular names:

Table 2: Vernacular names of *Abutilon indicum* in selected Indian languages

Tamil	Tutti, Tuththi, Peruntutti
English	Country mallow
Hindi	Kangahi, Kanghi, Kanghani
Kannada	Uchale gida
Malayalam	Dabi,Uram
Sanskrit	Kotibala, Kankatika
Telugu	Tutiri-chettu,Thuteribenda
Gujarati	Khapat,Kansi

Taxonomical classification [9]:

Table 3: Taxonomical classification of *Abutilon indicum*

Kingdom	Plantae
(Unranked)	Angiosperms
(Unranked)	Eudicots
(Unranked)	Rosids
Order	Malvales
Family	Malvaceae
Genus	<i>Abutilon</i>
Species	<i>indicum</i>



Figure 12. Whole plant



Figure 13- Leaves



Figure 14 - Flower

Figure 12,13,14: Whole plant, leaves and flower of *Abutilon indicum*

Botanical description:

This plant *Abutilon indicum* is an erect, perennial shrub reaching to a height of approximately 1.5 to 2 meters.

Morphological Features:

- **Leaves:** Broad, heart-shaped with serrated margins, covered in fine hairs.
- **Flowers:** Solitary, yellow to orange, bell-shaped with five petals.
- **Fruit:** Schizocarp with 10–15 mericarps; each mericarp contains kidney-shaped seeds.
- **Seeds:** Black, pubescent, reniform.

The plant grows well in dry, sandy soils and warm climates. ^[9]

Habit and habitat:

The species were originally found in number of tropical and subtropical regions. The plant is mostly originated from India, topical regions of Malaysia, Sri Lanka and America. It is found as a weed in sub regions of Himalaya tracta, and grow on the hills altitude up to 1200m and in hotter regions of India. It is also found within the parts of the ‘Great barrier Reef’ islands of the ‘Coral sea’. ^[9]

Traditional and ethnomedicinal uses:

Table 4: Traditional and Ethnomedicinal uses of different parts of *Abutilon indicum*

Plant Part	Traditional Use
Leaves	Wound healing, ulcers, inflammation, boils
Roots	Diuretic, anthelmintic, pulmonary sedative, febrifuge, used for urinary infections
Seeds	Demulcent, antitussive, used for urinary disorders, dysentery.
Whole Plant	Used in asthma, piles and tuberculosis

Almost all the parts of this plant are documented to be useful in ethnobotanical surveys conducted by ethnobotanists. It has been recorded in the scriptures of India, Malaya, Philippine Islands and Indochina use for its parts for the medicinal

purposes such antiemetic, anti-inflammatory, analgesic, antianthelmintic, in urinary or uterine discharge, piles and lumbago.

- ❖ The leaves and seeds are crushed and grinded to form a paste which is applied to penis to cure syphilis.
- ❖ The leaves are crushed and used as mouth wash, eye wash in cataract.
- ❖ Leaves are used to cure piles and to treat leg pain.
- ❖ This plants leaf paste is mixed with wheat flour to make bread and taken daily during night for one month for the cure of uterus displacement.
- ❖ The leaf juice when mixed with jaggery is used for the treatment of snakebite as antidote.
- ❖ The fruit concoction is used to treat cold, cough, piles and gonorrhoea.
- ❖ The fruit extract is mixed with ammonium chloride and water is given orally to treat hemorrhagic septicemia.
- ❖ Seeds are grinded and used orally as aphrodisiac and laxative.
- ❖ The roots are used to treat gonorrhoea and leprosy.
- ❖ Root infusion is used to cure dry cough, bronchitis and fever. ^[10]

Topical uses of *Abutilon indicum*:

Abutilon indicum is widely known for its topical applications in traditional medicine, particularly in Ayurveda and Siddha systems. One of its most notable uses is in wound healing. The fresh leaves or their paste are applied directly to wounds, ulcers, boils, and cuts to accelerate healing. This property is largely attributed to the presence of flavonoids (such as quercetin and luteolin), tannins, and saponins which possess antioxidant, anti-inflammatory, and antimicrobial properties.

These constituents promote collagen synthesis, epithelialization, and tissue regeneration, making the plant effective in treating chronic and infected wounds. ^[11] Studies such as those by Roshan et al. (2008) have confirmed its wound-healing potential in experimental models. ^[12] Additionally, *Abutilon indicum* is traditionally used to treat skin inflammations, abscesses, and boils. Warm poultices made from its leaves or flowers are applied topically to reduce swelling and pain. The mucilaginous nature of the plant provides a soothing, emollient effect that calms inflamed tissues. This demulcent action also makes it beneficial in treating piles and hemorrhoids when used as an external application, helping to relieve burning and irritation. ^[13] The plant is also employed for its analgesic effects. Leaf or root pastes are applied to painful joints, muscles, or injury sites to reduce localized pain and inflammation. ^[14] The flavonoids and β -sitosterol in the plant interfere with pain pathways and prostaglandin synthesis, which explains its traditional use as a pain-relieving agent. Its leaves are further used in treating skin conditions such as itching, eczema, heat rashes, and insect bites due to their anti-inflammatory and cooling properties. Traditional healers often use the aqueous extract of the leaves for cleansing and soothing irritated skin. ^[15] In oral care, decoctions of the leaves are used as mouth rinses for treating ulcers, gum infections, and sores. Its antimicrobial and healing properties help in maintaining oral hygiene and promoting mucosal repair. Furthermore, the plant has demonstrated antifungal activity, and the leaf extracts have been used traditionally to manage superficial fungal infections of the skin. ^[16] In folk cosmetics, *Abutilon indicum* is used as a herbal face wash or pack to soothe sunburn, acne, and blemishes, thanks to its antioxidant and skin-protective phytochemicals. The mucilage hydrates and softens the skin, while phenolic compounds like caffeic acid and ferulic acid combat oxidative



stress. ^[17] Overall, the topical benefits of *Abutilon indicum* are well-aligned with its chemical profile. It serves as a potent natural remedy for skin healing, inflammation, infections, and cosmetic care.

Phytochemical constituents of Different parts of *Abutilon indicum*:

Numerous bioactive compounds have been identified in its roots, leaves, flowers, seeds, stems, fruits, aerial parts, and whole plant extracts. These include alkaloids, flavonoids, steroids, phenolic acids, tannins, glycosides, amino acids, and essential oils. The following is a detailed compilation based on the study by Suryawanshi V.S. & Umate S.R. (2020) ^[18]:

A) Root:

- Rich in non-drying oil containing fatty acids such as linoleic, oleic, stearic, palmitic, lauric, myristic, caprylic, and capric acids.
- Unusual C17 carbon skeleton fatty acids.
- Presence of β -sitosterol and amyirin.

B) Flowers:

- Flavonoids identified include:
 - Quercetin-3-O- β -D-glucopyranoside,
 - Luteolin-7-O- β -glucopyranoside,
 - Quercetin-3-O- α -rhamnopyranosyl-(1 $\rightarrow$ 6)- β -glucopyranoside,
 - Gossypetin-7 and 8-O- β -glucosides,
 - Chrysoeriol, Apigenin-7-O- β -glucopyranoside, and Cyanidin-3-O-rutinoside.

C) Leaves:

- Steroids: β -sitosterol, cholesterol, stigmasterol.
- Flavonoids: Luteolin, Chrysoeriol, Quercetin.
- Phenolic acids: Eudesmic acid, Ferulic acid, Caffeic acid.
- Triterpenoids: β -amyirin-3-palmitate, squalene.

D) Fruit:

- Identified compounds: c-sitosterol, α -sitosterol, Lupeol, Lup-20(29)-en-3-ol acetate, 9,19-Cyclo-9a-lanostane-3a,25-diol, 2-Pentanone, and various xylene derivatives.

E) Seeds:

- Fatty acids: vernolic acid, sterculic acid, malvalic acid, stearic acid, palmitic acid.
- Amino acids: threonine, glycine, serine, glutamine, lysine, methionine, isoleucine, proline, alanine, cysteine, tyrosine, phenylalanine, leucine, asparagine, histidine, valine, arginine.
- Other compounds: alkaloids, steroids, terpenoids, saponins, phenols, cardiac glycosides, carbohydrates, proteins, reducing sugars.

F) Stem:

Compound extracted: 20,23-Dimethylcholesta-6,22-dien-3 β -ol.

G) Aerial Parts:

- Phenolic acids: p-hydroxybenzoic acid, glucovanilloyl glucose, gallic acid.



- Sterols: β -sitosterol.
- Flavonols: dimethoxy kaempferol, methoxy flavone-glucosides.
- Triterpenes: β -amyrin, lupeol.
- Alkaloids: vasicine.
- Others: methyl triacontanoate, caffeic acid, fumaric acid, p-coumaric acid.

H) Whole Plant:

- **Broad spectrum of compounds such as:**
 - β -sitosterol and its glucoside.
 - Phenolic acids: benzoic acid, hydroxybenzoic acid, caffeic acid, vanillin, syringaldehyde.
 - Quinones: 2,6-dimethoxy-1,4-benzoquinone.
 - Coumarins: scoparone, scopoletin, 3,7-dihydroxychromen-2-one.
 - Alkaloids and amides: aurantiamide acetate, N-feruloyl tyrosine, β -carbolines.
 - Ionones: 3-hydroxy- β -damascone, 3-hydroxy- β -ionol.
 - Lactones: alantolactone, isoalantolactone.
 - Vitamins: riboflavin.
 - Nitrogenous bases: adenosine, adenine, thymine.

This extensive phytochemical composition justifies the wide range of traditional and therapeutic applications of *Abutilon indicum* and underlines the need for further research to isolate, characterize, and utilize these bioactive compounds for novel drug development.

Pharmacological Activities:

Mohite et al. (2012) reviewed the pharmacological properties of entire plant of *Abutilon indicum* of its diverse range of medicinal applications. Studies have demonstrated that this plant has anti-diabetic, anti-inflammatory, antioxidant, antimicrobial, wound healing, hepatoprotective, immunomodulatory, anti-arthritic, analgesic, and anthelmintic activities. The plant extracts have been shown to reduce blood glucose levels, inflammation, and oxidative stress, while also protecting against liver damage and microbial infections. *Abutilon indicum*'s phytochemical composition, including flavonoids, tannins, alkaloids, and phenolic compounds, contributes to its medicinal properties. Further research is necessary to fully explore the plant's potential and develop effective treatments. This review highlights the significance of *Abutilon indicum* as a valuable plant for treating various ailments, and its potential for future pharmaceutical applications. ^[19]

Kailasam KV et al. (2015) conducted a comprehensive review of *Abutilon indicum* L. (*Malvaceae*), highlighting its medicinal potential. The author discussed the plant's traditional uses, phytochemical composition, and pharmacological activities, including anti-inflammatory, anti-proliferative, anti-arthritic, analgesic, sedative, antioxidant, antimicrobial, hepatoprotective, antidiabetic, anticancer, and immunomodulatory effects. *Abutilon indicum* contains various chemical constituents, such as phenolics, terpenoids, flavonoids, and pigments, that have been associated with protection from chronic diseases like heart disease, cancer, diabetes, and hypertension. The review provides a valuable overview of *Abutilon indicum*'s medicinal properties and its potential as a source of new drugs. ^[20] Another study conducted a



comprehensive review of the phytochemical constituents of *Abutilon indicum*, highlighting its importance as a medicinal plant in Ayurveda. The study revealed that *Abutilon indicum* contains a diverse range of bioactive compounds such as Alkaloid, Saponins, Amino acid, Flavonoids, Glycosides and steroids. Some important essential oil constituents like pinene, mucilage, tannins, caryophyllene, asparagines, caryophylleneoxide, endesmol, farnesol, borenol, geraniol, geranyl acetate, elemene and cineole have been reported. Phytoconstituents like Sitosterol, caffeic acid, fumaric acid, vanillin, coumaric acid, hydroxybenzoic acid, sesquiterpene including lactones and hexoses also been reported from different part of the plant. This study has provided a detailed review on the phytochemical properties of *A. indicum*, which may be helpful to provide an effective and useful plant product for further research. [21]

1. Anti-inflammatory and Anti-Proliferative Activity:

Kaladhar et al. (2014) evaluated the Anti-inflammatory and Anti proliferative activity of leaf extract of *Abutilon indicum*. In this study the Anti-inflammatory and Anti-proliferative activity of ethanolic leaf extract of *Abutilon indicum* for potential chemo preventive agent has been evaluated. The ethanolic leaf extract of *Abutilon indicum* exhibited strong anti-inflammatory activity by inhibiting the enzyme 5-lipoxygenase (5-LOX), with an IC₅₀ value of 8.89 µg/mL. 5-LOX plays an important role in the synthesis of leukotrienes which is a potent mediators of inflammation. The inhibition of this enzyme suggests that *A. indicum* can modulate the inflammatory cascade at the molecular level. Moreover, it showed anti-proliferative effects against A549 human lung carcinoma cells, with an IC₅₀ value of 85.2 µg/mL. Mechanistically, this

activity was linked to the upregulation of apoptotic genes such as CASP9, CASP3, TP53, CYCS, and downregulation of anti-apoptotic proteins like BCL2 and HSPA4. These findings suggest the potential utility of *A. indicum* in cancer chemoprevention by promoting apoptosis and inhibiting cellular proliferation. [22] Another study showed that the anti-inflammatory activity was confirmed in carrageenan-induced paw edema models, where ethanolic extracts of the leaves reduced inflammation significantly. Tail-flick latency tests also revealed significant analgesic activity comparable to standard drugs like diclofenac sodium. [23]

2. Antioxidant and Antimicrobial Activity:

Dhirender Kaushik et al. (2010) evaluated the antioxidant and antimicrobial activities of chloroform fraction of alcoholic extract of whole plant of *Abutilon indicum* extract was screened for antioxidant and free radical scavenging effects at various concentrations. The antimicrobial activity was studied using the agar well diffusion assay. The study concluded that the extract was found to be most effective against *Staphylococcus aureus* followed by *Bacillus subtilis* whereas in case of Gram negative bacteria the extract was found to be more effective against *E. coli* showing maximum microbial growth inhibition followed by *Pseudomonas aeruginosa*. The ethanolic extract also showed high microbial zone of inhibition against *C. albicans* than the standard drug amphotericin B. [24]

3. Anti-arthritic Activity:

Nitin S. Bhajipale et al. (2012) evaluated the various extracts of *Abutilon indicum* and investigated its anti-arthritic property using male albino rat model in *in-vitro* studies. Methanolic extracts of *A. indicum* demonstrated significant anti-arthritic activity in formaldehyde-induced



arthritis models in rats. At a dose of 400 mg/kg body weight, Treatment with *Abutilon indicum* 400 mg/kg had showed significant reduction ($P<0.01$) in paw volume on both 7th and 14th day. The extract markedly reduced paw volume and inflammation on the 7th and 14th day, indicating chronic anti-inflammatory potential. The underlying mechanism may involve inhibition of inflammatory cytokines (e.g., $\text{TNF-}\alpha$, $\text{IL-1}\beta$) and prostaglandin synthesis. In vitro, it inhibited protein denaturation and protease activity, both of which contribute to joint degradation in arthritis. [25]

4. Analgesic and Sedative Properties:

Deepraj Paul et al. screened the hydro-alcoholic extract of *Abutilon Indicum* for its analgesic and sedative efficacy. Hydro alcoholic extracts from aerial parts were evaluated in various animal models, including the Eddy's hot plate and acetic acid-induced writhing tests. The extract showed effective analgesic activity suggesting for both central and peripheral pain inhibition. As the extract has shown very significant ($P<0.01$) result in Eddy's hot plate, acetic acid induced writhing test and hot water immersion test. The extract may show GABAergic effect which concludes both central and peripheral pain inhibition. Author reported that in future it will gain more popularity to be used as a substitute for narcotics to treat pain and also as a good sedative. [26]

5. Hepatoprotective Activity:

Rohit Gupta et al. evaluated the hepatoprotective activity of hydroalcoholic and ethyl acetate extract of leaf of *Abutilon indicum* (AI) in CCl_4 induced toxicity in *Sprague dawley* rats. 200 mg/kg and 400 mg/kg of doses of hydroalcoholic extract and 200 mg/kg of ethyl acetate extract were administered to the rats to evaluate the hepatoprotective activity by using CCl_4 to induce

hepatotoxicity and using silymarin as the standard. When tested in CCl_4 -induced hepatotoxicity models in rats, both hydroalcoholic and ethyl acetate extracts significantly reduced liver damage. Key liver enzymes such as AST, ALT, ALP, and bilirubin were markedly improved in extract-treated groups compared to toxic controls. Histopathological examinations showed reduced liver necrosis and fibrosis in treated animals. The hepatoprotective action is possibly due to its antioxidant constituents neutralizing free radicals produced during CCl_4 metabolism. [27]

6. Anti-diabetic Activity:

Chutwadee Krisanapun et al. evaluated *A. indicum* L. improves insulin sensitivity. In diabetic rats, aqueous extracts of the whole plant decreased postprandial glucose levels. Molecular studies indicated that the extract activated GLUT1 promoter activity, facilitating increased glucose uptake into adipocytes. Furthermore, it acted as a $\text{PPAR}\gamma$ agonist, a receptor involved in insulin sensitization. These findings suggest the extract enhances both insulin sensitivity and glucose utilization, offering promise in managing type 2 diabetes. [28] Several studies demonstrate that ethanolic and aqueous extracts of *Abutilon indicum* significantly reduce blood glucose levels in diabetic animal models. Parimaladevi et al. (2003) reported that a methanol extract showed marked hypoglycemic activity in streptozotocin-induced diabetic rats, which may be due to increased insulin secretion or enhanced peripheral glucose uptake. [29]

7. Anticancer Activity:

Srikanth P et al. investigated different medicinal plants namely *Abutilon indicum* and *Blumea mollis*. These two plants were screened for its potential anti-oxidant properties and cytotoxic activity. The antioxidant potential, measured using



FRAP and DPPH assays, correlated well with the cytotoxic effects. The extract likely exerts anticancer action by inducing oxidative stress in cancer cells, inhibiting their proliferation, and triggering apoptosis. This dual antioxidant and cytotoxic behaviour supports its potential role in integrative cancer therapy. The extract was also screened to assess the antioxidant activity using Nitric Oxide radical inhibition estimated by the use of Griess Illosvoy reaction with slight modification. These extracts show anti-oxidant properties as well as inhibitory effect on cancer cells with the increased concentration and duration. [30]

8. Anti-diarrhoeal Activity

Chandrasekhar et al. evaluated anti-diarrhoeal activity of leaf extracts of *Abutilon indicum* by gastro intestinal motility, castor oil-induced diarrhoea and prostaglandin E2-induced enteropooling in albino rats. It was found that the methanolic extract and aqueous extract possess significant anti-diarrhoeal activity in castor oil induced diarrhoea and prostaglandin E2-induced diarrhoea and compared with the control. The extract decreased gastrointestinal motility and intestinal secretion (enteropooling), suggesting antispasmodic and antisecretory mechanisms. These effects could be mediated by inhibition of prostaglandin synthesis or direct action on intestinal smooth muscle tone. *Abutilon indicum* has showed significant anti-diarrhoeal activity similar to loperamide and can be recommended for further studies. [31]

9. Anti-convulsant activity:

Golwala et al. investigated the Anticonvulsant activity of *Abutilon indicum* leaf extract. The ethanolic extract increases the onset of clonic convulsions and decreases the onset of tonic convulsions and thus exhibiting a potential anti-

convulsant activity. The aqueous extracts showed significant protective effect by increasing the onset of clonic convulsion time and decreasing extensor time as compared to control group. This anticonvulsant effect was mainly due to the presence of linoleic acid or flavonoids. Hence *Abutilon indicum* may be an effective drug to treat convulsions. [32]

10. Larvicidal Activity

Abdul rahuman et al. (2008) investigated the larvicidal activity of various crude extracts of *Abutilon indicum* such as hexane, petroleum ether, acetone, ethyl acetate, and methanol. Various solvent extracts were tested against *Culex quinquefasciatus* larvae. All extracts showed moderate larvicidal effects whereas only petroleum ether extract showed highest larvicidal activity. Furthermore, ¹H NMR, ¹³C NMR and mass spectral data confirmed the identification of β -sitosterol as a potential new mosquito larvicidal compound with LC50 value of 26.67 ppm against *C. Quinquefasciatus*. This suggests potential application in eco-friendly mosquito control strategies. [33]

11. Wound Healing Activity

P Ganga suresh et al. (2011) evaluated the wound healing activity of *Abutilon indicum* Linn. In incision and excision wound models, petroleum ether extracts promoted faster wound contraction compared to ethanolic extracts. The treated groups exhibited increased epithelialization and collagen deposition, indicating enhanced tissue regeneration. Flavonoids and triterpenoids may play a role by modulating inflammatory mediators and fibroblast activity. The progressive changes in the wound area were monitored by tracing the wound margin every day. There was a rapid increase in wound healing rate. From the result, it is concluded that the petroleum ether extract of



Abutilon indicum Linn had greater wound healing activity than the Ethanolic extract. [34]

12. Anti-asthmatic Activity

Paranjhape AN et al. (2006) studied the safety and efficacy of *Abutilon indicum* in patients having bronchial asthma. Dried parts of *A. indicum* were finely powdered and 1 gm of dose is given to 30 patients of either sex in the age range of 15 - 80 years those having mild to moderate bronchial asthma with or without any concurrent medication. The respiratory functions (FVC, FEV, FEF and MVV) were assessed using a spirometer prior to and after 4 weeks of treatment. After 4 weeks of treatment with the drug, has showed significant improvement of pulmonary functions in asthmatic patients. Also significant improvement was observed in clinical symptoms and severity of asthmatic attacks. [35]

13. Diuretic Activity:

Seed extracts at 200 and 400 mg/kg significantly increased urine output and sodium excretion in rats. However, no potassium-sparing effect was observed. This diuretic activity suggests mild natriuretic properties that can be useful in conditions like hypertension and edema. [36]

14. Anti-estrogenic Activity:

Methanolic extracts suppressed uterine weight gain and peroxidase activity in estrogen-treated ovariectomized rats. These findings point to estrogen receptor antagonism or suppression of estrogen-induced gene expression. This may be helpful in managing estrogen-dependent conditions such as endometriosis and certain cancers. [37]

Toxicity And Safety Profile:

Toxicological assessments have demonstrated that *Abutilon indicum* extracts are safe up to 2000 mg/kg in rats, with no significant changes in behaviour, haematological, or biochemical parameters. However, long-term safety and teratogenicity studies are limited. [38]

CONCLUSION AND FUTURE PERSPECTIVES:

Abutilon indicum is a versatile and underutilized medicinal plant with validated traditional uses and proven pharmacological activities. Its rich phytochemical composition contributes to its therapeutic effects, especially in managing diabetes, liver diseases, inflammation, and microbial infections. Given the increasing interest in herbal medicines, *A. indicum* offers immense potential for pharmaceutical development. [39,40] This medicinal plant has substantial potential for the development of topical herbal formulations, since for its long-standing traditional use in treating skin ailments, wounds, inflammatory conditions, and infections supported by a variety of phytochemical and pharmacological evidence. [41] Various parts of the plant—especially the leaves, flowers, and seeds—contain bioactive compounds such as flavonoids (quercetin, luteolin), tannins, saponins, β -sitosterol, phenolic acids, and mucilage, which contribute to its anti-inflammatory, antimicrobial, antioxidant, analgesic, and wound healing properties. [42] These properties make *A. indicum* a highly suitable candidate for incorporation into topical applications such as creams, gels, ointments, sprays, and herbal patches. The plant's mucilaginous and emollient nature offers additional benefits in providing skin hydration, soothing irritation, and promoting tissue regeneration - key requirements in effective topical therapeutics. Its antimicrobial potential is particularly useful in protecting wounds and

inflamed skin from secondary infections, while its antioxidant activity supports skin repair and combats oxidative stress. [43]. Considering its strong ethnopharmacological background and scientific validation, formulating a topical product with *Abutilon indicum* offers promising therapeutic and cosmetic applications. However, further research is essential to standardize extraction methods, determine optimal concentrations, evaluate stability, and assess skin permeation and bioavailability. Safety evaluations including dermal toxicity, irritation, and sensitization studies are also critical before clinical or commercial use. In conclusion, *Abutilon indicum* offers a powerful combination of traditional wisdom and pharmacological effectiveness, especially for dermatological conditions. Its inclusion in topical herbal formulations represents a natural, cost-effective, and sustainable approach for skin therapy. With appropriate formulation development and scientific rigor, this plant can serve as a key active ingredient in modern phytocosmetic and therapeutic skincare products.

However, current data are mostly derived from in vitro and animal studies. Future work should focus on:

- Isolation of specific active constituents
- Elucidation of molecular mechanisms of action
- Pharmacokinetic profiling
- Toxicity and safety evaluations in long-term studies
- Clinical trials in humans

Standardized herbal formulations and clinical validation could enable *Abutilon indicum* to

become a cost-effective and natural therapeutic option for various chronic diseases.

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HOW TO CITE: Mahalakshmi N.*, Sakthi Abirami M., Jeevitha C., Keerthana V., A Comprehensive Review on *Abutilon indicum* (Linn.): Pharmacological and Phytochemical Insights, *Int. J. of Pharm. Sci.*, 2025, Vol 3, Issue 9, 2755-2767
<https://doi.org/10.5281/zenodo.17189636>

