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A Systematic Review on Ethnomedicinal and Phytopharmacological approach of *Acalypha indica*Leaf used as indigenous system of medicine.

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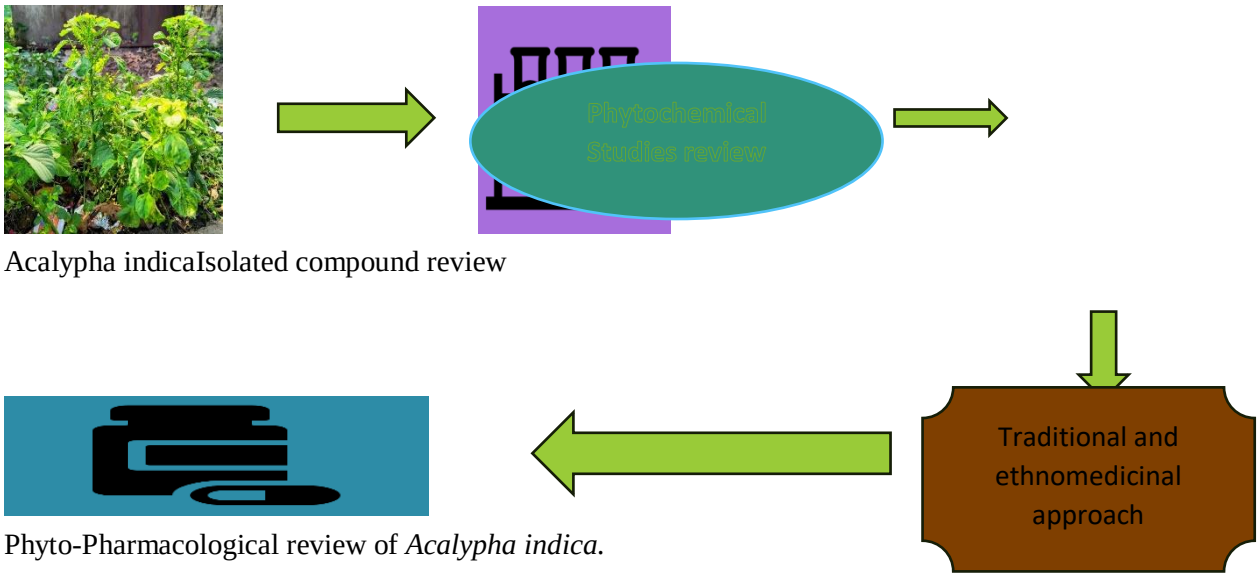
Abstract:

Acalyphaindica, a plant with a rich history in Ayurveda and Siddha, is attracting interest for its potential to treat various health problems. This review explores its chemical makeup, pharmacological effects, and potential therapeutic uses. Researchers have identified promising bioactive compounds like tannins and flavonoids within the plant. Extracts and isolated compounds show a range of benefits including wound healing, anti-asthma effects, and even antivenom activity. Recent studies reveal *Acalyphaindica* potential as a multifaceted therapeutic agent with anti-inflammatory, antibacterial, antioxidant, and even anti-diabetic properties. These findings not only validate its traditional uses but also suggest new applications like treating coughs (expectorant), fluid retention (diuretic), and worm infections (anthelmintic). Overall, this review adds valuable knowledge about *Acalyphaindica*, solidifying its position as a powerful medicinal plant with diverse therapeutic possibilities.

Key words: *Acalyphaindica*, Phytopharmacological, Ethnomedicinal, Phytochemical, Ayurvedic

Pictorial Abstract:



Acalypha indicaIsolated compound review

Phyto-Pharmacological review of *Acalypha indica.*

Introduction:

Even though plants are frequently used in traditional medical systems, some people continue to favour natural cures because they are worried about the negative effects of chemical pharmaceuticals. *Acalypha indica* is one such plant that has useful medical qualities and is a common weed in tropical regions. Depending on the locale, this annual grows quickly and goes by many names. Studies indicate that the herb possesses anti-inflammatory, antifungal, and antibacterial characteristics. This section explores *Acalypha indica*chemical makeup and possible medical use. The plant, which is a member of the Euphorbiaceae family, goes by many common names in different places. The text also looks at how to take the active components out of this plant. [1]With a bitter flavour, *Acalypha indica* has been traditionally used to treat a number of illnesses, such as pain alleviation, constipation, coughing, and urinary issues. This perennial herb has many long, branching stems that are softly haired. The leaves are smooth, slender, and oval-shaped. Owing to the plant's considerable interest in research, we have put together an extensive overview of its traditional applications, chemical composition, and therapeutic benefits**(Dineshkumar B et al.2010)** .[2,3] *A. indica* boasts a rich history in traditional medicine, with people applying the entire plant, particularly the leaves, to address various ailments. These include respiratory issues like asthma and pneumonia, stomach problems, wound healing, and even snake bites, though further research

is needed on the latter.[4,5,6] This traditional use has fuelled scientific exploration, and research has confirmed valuable properties within the leaves. Notably, the leaves exhibit antibacterial activity, potentially aiding wound healing and fighting infection**(Govindaranjan et al. 2008)**. [7] Additionally, they possess anti-inflammatory properties that might help manage various conditions, and antioxidant properties that protect cells from damage. [8, 9] Interestingly, research isn't limited to the leaves. Studies using diabetic rats suggest promise for the stems as well. These stems may hold antioxidant properties similar to the leaves, potentially regulate blood sugar levels, and even offer protection to the liver **(Rao k et al.2016)**.[10] Plants have been an essential part of medicine for thousands of years, acting as a natural pharmacy for both conventional and traditional treatments. The enormous range of chemical substances found in plants known as bioactive molecules is the source of this rich legacy. These molecules serve as nature's equivalent of a pharmacy, offering an extensive supply of various medications. These include alkaloids, which are well-known for their strong effects on pain relief (morphine), tannins, which have astringent qualities and may help heal wounds, flavonoids, which have anti-inflammatory and antioxidant qualities, and phenolic compounds, which support cardiovascular health and cell protection.Exploration of this natural treasure trove is still ongoing, and it has great potential to bridge the gap between traditional wisdom and contemporary scientific discovery in the field of medicine.[11,12]

Geographical distribution habitat:[13,14]

While it may grow in many disturbed habitats, *Acalypha indica* is most happy in moist, shaded locations. These areas may consist of riverbanks, wastelands, and moist, shaded undergrowth**(De M 2023 et.al)**. The plant can thrive near human populations and along streams because of its resilience to slightly damaged ecosystems.Not only is *Acalypha indica* L. a familiar sight in India, but it may also be found growing right in your backyard as a possible healer! This annual herb with therapeutic properties is found in backyards all throughout the plains of India, where it thrives because it likes damp conditions**(Mondal R et.al 2021).**

Plant description(Taxonomy):

The leaves of Acalypha indica have a distinctive pattern that spirals upward along the stem. Typically reaching 2-9 cm long and 1-5 cm wide, these simple leaves have a broad ovate or oval-lanceolate form. Acute refers to the sharp point at the tip of the leaf, whilst the base tapers like a wedge. Because of the little, sawtooth-like notches on the edges, they are

serrated. Remarkably, as leaves mature, they become globous (smoother), albeit some small hairs may still be present, particularly along the middle vein. However, the hair on the leaves of younger plants is frequently more apparent.Acalypha indica blooms are loosely elongated clusters near the top of the stems, rather than solitary flowers. These clusters develop at the leaf-stem junction, or the leaf axil **(Chekuri S et al. 2020 and Kirtikar KRB.et al. 1918**).[15,16]

Figure 01- Plant profile of *Acalypha indica*

Figure 02- Plant leaf of *Acalypha indica*.

Profile: (Chekuri S et al. 2020)[16]

Domain: Plant Life

Subcategory: Flowering Plants

Species Class: Acalypha

Further Division: Advanced Flowering Plants

Order Designation: Malphighiaceae

Family Grouping: Euphorbiaceae

Phytochemical Properties studies: (Shown in table no 01)

Table no 01- Preliminary phytochemical status of different solvents used. [11-32]

Sl No	**Solvents used in Extraction**	**Phytochemical Screening result**	**Reference**
1	Aqueous Extract	Numerous beneficial phytochemicals, such as saponins, flavonoids, steroids, phenols, alkaloids, tannins, and even cardiac glycosides, were discovered during analysis of *Acalypha indica.*	[11,17,18]
02	Crude water, Soxhlet water,	All four extracts included flavonoids, coumarin, and saponin, demonstrating	**(Thenmozhi. S et.al 2012).**

	crude alcohol, Soxhlet alcohol Extract	their uniformity throughout various extraction techniques. It's interesting to note that alkaloids were present in every extract except the crude alcohol extract, indicating that a particular extraction technique may be required to separate them. Furthermore, steroids were only found in the Soxhlet aqueous extract, suggesting that a more focused method may be needed to extract them. Interestingly, anthraquinones and triterpenoids were completely lacking, while tannins were only present in the unrefined aqueous extract. Conversely, phenol was found in the aqueous, Soxhlet, and crude alcohol extracts.	[19,20]
03	Powdered *Acalypha indica* leaves and extracted several chemical components from them using a Soxhlet extractor. To do this, they employed various solvents (methanol, acetone, petroleum ether, hexane etc).	Alkaloid and tannin present	[21,22,23]
04	Ethanol Extract of *Acalypha indica.*	Several possibly helpful chemicals were found in *Acalypha indica* after a preliminary chemical investigation. These	**(Godipurge SS, et.al 2014.)** [24]

		consist of flavonoids, phenolic chemicals, terpenoids, glycosides, saponins, and tannins. These compounds have been discovered as potentially explaining, at least in part	
05	Ethanol and aqueous extracts	Numerous chemicals with possible medical use were found in *Acalypha indica* leaves after examination. Common elements found in both the ethanolic and aqueous extracts included terpenoids, flavonoids, saponins, and even cardiac glycosides. Remarkably, the inclusion of steroids and tannins in the ethanolic extract added another level of molecular complexity. Given its varied chemical profile in both extracts, *Acalypha indica* seems to be a promising candidate for more research into its possible health benefits.	**(Mohideen et al.2012)** [25,26]
06	Ethanolic extract of whole part of plant	An intriguing distribution of the phytochemicals under investigation was found by analysing the chemical composition of the plant. None of these compounds were found in the stems or shoots, despite the fact that they were all found concentrated in the leaves. The image painted by the roots was different; while they contained trace levels of certain phytochemicals, they were completely devoid of others.	**(Tasmim, Mim E. et al.2021)** [27]
07	The whole plant was initially	Results from a preliminary chemical examination of extracts from *Acalypha*	(**Kumar PK .et al. 2016)**

	ground into a fine powder in order to look into the possible chemical diversity inside Acalypha indica. After that, this powdered material was subjected to many separate extractions, each using a different solvent. Researchers sought to separate a greater variety of chemicals from the plant by utilizing different solvents.	*indica* were encouraging. A diverse array of bioactive substances, including alkaloids, glycosides, phenols, tannins, saponins, and steroids, were found in the analysis. The wide variety of compounds found in Acalypha indica raises the possibility that the plant has intriguing biological qualities that merit additional research.	[28]
08	Methanolic extract	To observe the phytochemical components, present in methanolic extract, qualitative preliminary screenings of extracts were conducted initially using special chemical reagents. Alkaloids, saponins, tannins, flavonoids, steroids, terpenoids, and phenolic chemicals are all present in the extract.	[29]
09	Petroleum ether, chloroform, benzene, ether, ethanol, water Successive	A thorough understanding of the extracts' chemical makeup was obtained by a qualitative chemical analysis. Numerous phytochemicals, such as alkaloids, glycosides, phenolic compounds,	**Adhav M.et al. 2016.** [30]

	Solvent Extraction.	carbohydrates, tannins, proteins, gums, mucilage's, and amino acids, were detected by this research. It is interesting to note that neither oils nor fats nor saponins nor flavonoids were found in the analysis. These results point to functions for the compounds that have been identified and offer a foundation for more research into the possible qualities of the extracts.	
10	Solvents used as gradient elution technique.	The phytochemical profile of the *A. indica* extract was investigated, and the findings were intriguing. Testing was done on eight distinct phytochemicals, and the results showed that five important substances were present: tannins, saponins, alkaloids, flavonoids, and phenols. Given that each class of discovered phytochemicals is recognized for having a variety of health advantages, these results provide important insights into the extract's possible bioactivity. To fully understand the unique characteristics and possible uses of these fascinating chemicals found in the A. indica extract, more investigation is necessary.	**Balasubramanian N . et. Al 2020** [31]
11	Powdered crude sample	An intriguing picture of *A. indica* L.'s possible health advantages is presented by a chemical screening. Numerous phytochemicals, including alkaloids, flavonoids (including subclasses such as flavonols, flavononols, and flavones), tannins, phenolics, coumarins, and phlobatannins, were found to be positively correlated with the analysis.	**Umate, Satish. Et al. 2018** [32]

		Furthermore, it was determined that terpenoids, cardenolides, and saponins were present.	

Phytochemical approach in *Acalypha indica* leaf:

Numerous bioactive substances were found in *Acalypha indica* after a chemical examination. Notably, potassium brcvitolincarboxylatc and acaindinm, two previously unidentified hydrolyzable tannins, were discovered by the researchers. In addition to these new findings, the study verified the existence of eight well-characterized tannins: corilagin, geraniin, acetonylgeraniin A, euphormism M_2, repandusinic acid A, 1-O-galloyl-β-D-glucose, 1,2,3,6-tetra-O-galloyl-β-D-glucose, and chebulagic acid. Additionally, the study detected two flavonoid glycosides: rutin and quercetin 3-O-β-D-glucoside. This wide range of bioactive substances emphasizes *Acalypha indica*potential for additional research**. (MaYT. et al .1997)**[33]

Studies have shown that its leaves contain a variety of phytochemicals, including aurantiamide. These naturally occurring substances, known as phytochemicals, may have positive effects on health. *Acalypha indica* leaves contain aurantiamide, indicating that more research is necessary to fully comprehend the plant's potential uses. **(Raj et al.200)** [34]

Different isolated phytochemical by Analytical method of *Acalypha indica*.(shown in table no-02)

Different isolated phytochemical by Analytical method of *Acalypha indica*. (Table no 02). [35-50]

Chromatography method	**Compound name**	**Reference**
High resolution liquid chromatography	Polyphenol fraction	[35]
X-Ray crystallography	Acalyphin, epiacalyphin	[36]
Gas Chromatography–Mass Spectra	2-hydroxy-1-(hydroxymethyl), ethyl ester	[37,38]
Nuclear magnetic Resonance	Tri-O-methylellagic acid.	[39]
Gas Chromatography–Mass Spectra	Clotrisiloxane	[40,41]
High pressure liquid chromatography	Hesperidin	[42,43,44]

Gas Chromatography–Mass Spectra	Hexadecanoic acid	[45,46,47]
Aluminium chloride Method	Flavanones,	[48,49,50]

Ethnomedicinal traditional approach:

In western Odisha, people have long used the *Acalypha indica* plant for medical purposes. Tribal and non-tribal groups have been using the plant to treat a variety of illnesses thanks to traditional knowledge that has been passed down through the decades. Scholars have taken notice of this traditional knowledge, with multiple investigations proving that *Acalypha indica* has therapeutic value. These studies lay the groundwork for more research to fully understand this fascinating plant's medicinal potential.[51]

Ayurvedic herb or Folk medicinal uses:

Beyond national boundaries, *Acalypha indica* is widely used in traditional medicine throughout Asia and Africa. Its long history of use is demonstrated by the fact that its leaves form an essential part of Ayurvedic treatments in India. Even while it might not be as common in other nations, it nonetheless finds use in their ethnomedical customs. It's interesting to note that different parts of the plant are employed for different purposes; depending on the condition, roots, stems, and leaves can all be used. In addition, the way the plant is administered matters a lot. It can be taken either by itself or in combination with other substances to provide a beneficial impact. The state of the plant—fresh or dried—can also affect how effective it is as a medicine. These many elements emphasize the geographical differences and difficulty of using *Acalypha indica.*[16]

Historically, *Acalypha indica* has been used in a variety of medicinal formulations to treat a range of conditions. The plant's decoction is said to have laxative properties that facilitate digestion. The plant itself is used to cure severe coughs, especially those that are associated with haemoptysis, or coughing up blood, as well as early-stage Tuberculosis. The leaf juice is extracted and used topically to treat a variety of skin conditions. It's interesting to note that fresh leaf juice has the ability to cause vomiting, which suggests that it may help youngsters suffering from croup, a respiratory illness. These conventional uses demonstrate the wide range of possible health advantages of *Acalypha indica*, which calls for more research to confirm the plant's safety and efficacy.[52]

Sidha herbs as *Acalypha indica:*

Originating in South India, the medical system known as Siddha has a long and illustrious history that dates back to the eighteen Siddhars, who were highly esteemed for their proficiency in yoga, medicine, and other disciplines. *Acalypha indica* is acknowledged as a

significant therapeutic herb in this conventional medical system. Utilizing a particular *Acalypha indica* compound known as "Charu" for its antifungal qualities has showed potential in research. Charu has demonstrated noteworthy efficacy against four distinct fungal pathogens that cause skin disorders, indicating its potential for use as a dermal infection therapy. These results indicate the insightful qualities present in Siddha therapy and open up new avenues for investigating the therapeutic potential of Acalypha indica. [53]

The leaves of *Acalypha indica* have long been used as a versatile medicinal herb in many different areas. In India, children can cause vomiting or purging by using leaf juice or decoction, which may help them get rid of worms. The leaves are used externally in a variety of ways, such as boiling juice for pain treatment, scabies paste, ulcer paste, turmeric paste, and arthritic paste. Remarkably, root decoction serves as a purgative, and leaf powder can be used to treat bedsores. Outside of India, East Africa applies leaf powder to wounds infected with maggots and leaf sap as eye drops. Seychelles uses leaf infusion as a purgative and root decoction for worms and stomach-aches. Interestingly, Acalypha indica is also used in India as a decoction for diarrhoea and as an expectorant for pneumonia and asthma. [54,55]

Phyto-Pharmacological approaches of *Acalypha indica*.(Shown in Table no 03)

Table no.03: Biological activities of *Acalypha indica*[56-91]

Sl no	**Biological Activity**	**Observation**	**References**
01	Antimicrobial	**1.** A study explored *Acalypha indica* potential as an antimicrobial agent. Extracts from the plant were tested against bacteria and fungus. Water and ethanol extracts fought gram-positive bacteria effectively, while only the chloroform extract showed antifungal activity. These findings were compared to common medications and support the traditional use of Acalypha indica for treating infections**.**	[56,57,58,59, 60,61]

		2. An investigation examined the antibacterial properties of *Acalypha indica* leaf derivatives against diverse bacterial strains. The derivatives exhibited efficacy against gram-positive bacteria (like Staphylococcus aureus) at a remarkably low minimum inhibitory concentration (MIC) of 0.156 mg/ml. Notably, only Pseudomonas aeruginosa, among the gram-negative bacteria tested, displayed susceptibility to the derivatives. 3. The ability of *Acalypha indica* to fight certain germs was discovered via research. With 14 millimeter inhibition zones produced by Salmonella typhi, Bacillus subtilis, and Escherichia coli, the botanical extract had the most inhibitory effect. This suggests that Acalypha indica may be helpful in treating these particular types of bacteria**.** 4. To evaluate the antibacterial activity of many extracts made from the *Acalypha indica* plant, including petroleum ether, chloroform, acetone, methanol, and ethanol, scientists looked at them. They used the usual disc diffusion approach to target four common types of bacteria: Escherichia coli, Pseudomonas aeruginosa, and Staphylococcus aureus. The results showed that, in comparison to the other extracts, the petroleum ether extract was more effective at inhibiting the growth of bacteria**.**	
02	Antioxidant	1.The study extended beyond antimicrobial attributes, encompassing an analysis of the	[62,63,64,65]

		antioxidant potential of *Acalypha indica* extracts using hexane, chloroform, and methanol. In the DPPH assay, these extracts exhibited IC50 values, indicating potency, ranging from 5.70 to 7.79 mg/mL, underscoring their notable antioxidant efficacy. Validation of their antioxidant capacities was reaffirmed through the widely used for screening and routine determinations. assay, yielding consistent results. 2. Investigated *Acalypha indica* extracts utilizing two distinct methodologies. X-Ray Fluorescence was employed to identify the components within the extracts, while the DPPH technique was utilized to assess their total antioxidant capacity. Contrasting the ethanol extract (5.94%), the methanol extract yielded the highest proportion (14.83%). Moreover, variations in water and ash content were observed among the extracts; methanol exhibited lower water content (10.57%) and higher ash content (17.44%) compared to ethanol (35.66% water and 17.93% ash**).**	
03	Antiulcer	Looked at *Acalyphaindica's* potential as an ulcer-fighting herb. They administered a methanolic extract (MEAI) to rats that had ulcers brought on either swim stress or pylorus ligation. In these rats, the MEAI markedly decreased the total stomach volume, the quantity of acid generated in the stomach, and the development of ulcers ($p < 0.001$). These encouraging findings imply that *Acalypha indica* may be a useful natural ulcer treatment.	[66,67,68,69]
04	Hepatoprotectiv e	1.A study investigated the potential liver-protective attributes of *Acalypha indica*. Researchers found that the plant's methanol	[70,71,72,73, 74]

		extract possesses hepatoprotective properties, implying its potential to safeguard the liver from damage. This protective influence may be linked to the extract's flavonoid content. Antioxidants, like flavonoids, are recognized for their ability to counteract free radicals that can jeopardize liver cells. Taken together, this study suggests that Acalypha indica holds promise as a natural strategy for liver protection**.** 2.The study suggests several potential mechanisms underlying the liver-protective effects of the ethanol extract. One hypothesis is that the extract modulates cytochrome P450 enzyme-mediated processes, crucial for the liver's metabolism of various substances. Moreover, it may aid in preserving the endoplasmic reticulum, a vital organelle involved in detoxification and protein synthesis, potentially promoting liver regeneration. Additionally, the presence of flavonoids in the extract could enhance its overall antioxidant activity, offering further defense against liver damage induced by free radicals. These findings underscore the potential of *Acalypha indica* as a natural liver-protective agent, operating through diverse pathways**.**	
05	Wound healing	A study looked at whether an extract from *Acalypha indica* accelerated healing of wounds. Rats with similar wounds were either left untreated or treated with the extract. According to analysis, the extract accelerated wound closure, most likely as a result of higher collagen synthesis and quicker skin development. These findings imply that the extract may be used in the development of future wound treatments**. (Yeng**	[75,76,77]

		NK. Et al 2018)	
06	Anti-inflammatory	1.A research investigation found that a methanol extract derived from *Acalypha indica* L. significantly and in a dosage-dependent manner reduced inflammation in the paws of rats. Even at lower doses, the extract exhibited effectiveness comparable to phenylbutazone, a well-known anti-inflammatory drug. **2.** Through an in-vitro approach, researchers delved into the anti-inflammatory attributes of *Acalypha indica* leaves from the Euphorbiaceae family. The leaves underwent water steeping to generate an extract post the elimination of lipids using petroleum ether. Subsequently, this extract underwent scrutiny via a method devised by Mizushima and Kobayashi at three varying concentrations: 200 mg/kg, 400 mg/kg, and 600 mg/kg. As a comparative standard, Ibuprofen was administered at a dosage of 100 mg/kg. Remarkably, at higher concentrations, the *Acalypha indica* extract exhibited a progressive inhibition of protein denaturation, achieving 81.1% at 600 mg/kg in contrast to the control. Notably, at the 600 mg/kg level, the extract's anti-inflammatory efficacy mirrored that of ibuprofen (85.71%). These findings underscore the significant potential of *Acalypha indica* leaves as a viable anti-inflammatory agent.	[78,79,80,81, 82,83,84]
07	Anti-Cancer	1.Researchers investigated the cytotoxic impact of a hexane extract derived from *Acalypha indica* leaves on MCF-7 breast cancer cells, evaluating its ability to induce cell death. Cell viability was gauged using the MTT test, with Cisplatin serving as the control group. Various	[85,86]

		concentrations of the extract (10, 25, 50, and 100 µg/ml) were administered to the cancer cells. The most pronounced inhibitory effect was observed at a concentration of 50 µg/ml. The objective of this study was to identify the active compounds within Acalypha indica extracts that may possess anti-cancer properties and to explore their potential efficacy. **(Chekuri S. et al. 2017)** **2.** Scientists examined the effects of isorhamnetin, a compound isolated from *Acalypha indica*, on A375 melanoma cells. Isorhamnetin exhibited potent antiproliferative properties in an MTT assay, displaying an IC50 of 8.26 µg/ml. The study delved into melanin content and tyrosinase activity, crucial factors in melanoma, utilizing staining techniques to elucidate the mechanism of cell death induced by isorhamnetin. Additionally, the impact of isorhamnetin on apoptosis-related genes was thoroughly investigated via western blotting. Findings revealed that isorhamnetin induces cell cycle arrest at later stages while initiating early cessation. Moreover, it upregulates pro-apoptotic protein bax while downregulating anti-apoptotic genes such as Caspase 3, Caspase 9, and BCL-2, suggesting isorhamnetin prompts programmed cell death in melanoma cells.	
08	Neuroprotective	This study explored the effects of a water extract of *Acalypha indica*, commonly referred to as Akar kucing, on isolated frog muscle tissue, aiming to evaluate its potential in maintaining and improving nerve function. Researchers administered doses ranging from 15 to 20 mg of the extract. While the extract exhibited some	[87,88,89]

		promise in neuroprotection and neurotherapeutic advantages, the outcomes did not reach statistical significance compared to the control group. This suggests the necessity for further research to determine the potential benefits of this extract for neurological disorders.	
09	Acaricidal activity	The leaves of *Acalypha indica* have the potential to be a useful natural treatment for mites. According to research, these leaves have the ability to kill mites since they have acaricidal qualities. In vitro laboratory experiments have demonstrated that a leaf paste efficiently eradicates mites in 48 hours. Even more promising, additional research on live animals (in vivo) containing mites showed that the paste killed the mites in 4 hours. This quicker result was paired with a decrease in skin lesions, indicating that the paste could not only eliminate mites but also lessen the discomfort they cause. **(Singh D . et al .2004)**	[90]
10	Diuretic activity	Researchers looked at *Acalypha indica* possible diuretic effects. They used albino mice to evaluate a plant extract in methanol. It's interesting to note that at 400 mg/kg body weight, the Acalypha indica extract had the most diuretic impact. Compared to the usual diuretic medication frusemide, which was administered at a significantly lower dosage (20 mg/kg), this impact was even more noticeable. These results imply that Acalypha indica may have a diuretic effect, at least in mice; nevertheless, more studies are required to verify the safety and effectiveness of this plant in people.	[91]

Conclusion:

The exhaustive examination conducted within the literature review underscores the profound therapeutic potential inherent in *Acalypha indica*, revealing its remarkable efficacy across a spectrum of medical conditions. *Acalypha indica* emerges as a formidable cornerstone in traditional medicinal practices, showcasing its adaptability and substantial impact on human well-being by aiding in wound healing, as well as demonstrating notable anti-asthmatic and anti-venom properties.

Moreover, the revelation of bioactive compounds within *Acalypha indica* marks a pivotal moment, ushering in exciting new avenues for exploration and study. The discovery of these compounds not only broadens our understanding but also ignites curiosity about their potential, particularly in relation to bronchodilation. This aspect stands out as particularly noteworthy, offering a fertile ground for further investigation and potential breakthroughs.

Future research endeavours hold the promise of unravelling the intricate mechanisms underlying the pharmacological effects of *Acalypha indica*. By employing a diverse array of animal models and employing meticulous isolation techniques for various substances, researchers will be poised to delve deeper into the complexities of its medicinal properties. This concerted effort will contribute significantly to advancing our understanding and potentially harnessing the full therapeutic potential of *Acalypha indica* for the benefit of medical science and human health.

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Conflict of interest:

The authors affirm that they have no conflicts of interest to disclose. All co-authors have reviewed and approved the manuscript, and there are no financial interests to declare. We confirm that this submission represents original work and is not currently under review by any other publication.

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