

A Promising Nature Gift *Acalypha hispida*: A Review

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Received: 02nd January, 2023; Revised: 20th January, 2023; Accepted: 04th May, 2024; Available Online: 25th June, 2024

ABSTRACT

Acalypha hispida is classified within the taxonomic family Euphorbiaceae. It is a tropical shrub and an annual plant that is colloquially referred to as the chenille plant or Red hot cat tail. The species under consideration is indigenous to the southern Pacific region, specifically the Malay Archipelago and many islands within the East Indies. The plant is frequently used as a decorative element in outdoor and indoor settings. Historically, the leaves have been recognized for their laxative and diuretic properties and employed in the therapeutic management of leprosy and gonorrhoea. Various plant components are additionally employed in treating infectious diarrhoea respiratory ailments and as an expectorant for asthma. *A. hispida* has been documented to possess many pharmacological properties, including anti-inflammatory, antioxidant, hypoglycemic, antimicrobial, antifungal, trypanocidal, and cytotoxic effects. The analysis of *A. hispida* provides a comprehensive overview of its pharmacological properties, chemical composition, biological effects, and toxicological investigation. This review presents a comprehensive overview of the research conducted on the plant, aiming to provide current and relevant information for future investigations.

Keywords: *Acalypha hispida*, Phytochemicals, Pharmacological activities, Chemical constituents, Cultivation collection, Trypanocidal activity, Antimicrobial, Antioxidant, Antidiarrheal, Anti-leishmanial.

International Journal of Pharmaceutical Quality Assurance (2024); DOI: 10.25258/ijpqa.15.2.80

How to cite this article: Jodh RV, Kawtikwar P, Kawtikwar AP, Khobragade S. A Promising Nature Gift *Acalypha hispida*: A Review. International Journal of Pharmaceutical Quality Assurance. 2024;15(2):1081-1086.

Source of support: Nil.

Conflict of interest: None

INTRODUCTION

Traditional medicine has a prominent role in healthcare systems worldwide, either as the primary mode of healthcare provision or as a supplementary approach. Traditional medicine has a significant role in low-income countries. It is employed individually or in conjunction to address, ascertain, and prevent maladies or uphold overall health. Nature has served as a rich reservoir of therapeutic compounds for millennia, with numerous contemporary pharmaceuticals derived from natural sources due to their historical utilization in traditional medicine.¹ Medicinal herbs are widely employed across the globe for the treatment of common ailments in everyday life. The therapeutic properties of these plants are attributed to specific chemical compounds that elicit distinct physiological responses within the human body. This particular organism is classified within the taxonomic family Euphorbiaceae.² The plant in question is a vertically oriented shrub with limited branching, often employed for decorative purposes in both outdoor and indoor settings. *Acalypha hispida*, known by its common name, chenille plant, is a blooming species characterized by an extended duration of blossoming. It is also

referred to as Philippine medusa and red-hot cattail in English.³ The blooms exhibit a pendulous arrangement reminiscent of cat tails, with clusters reaching a maximum length of 18 inches. Their coloration ranges from a vibrant red to a rich, deep pink hue. The leaves of *A. hispida* exhibit an oval shape, measuring approximately 6 to 8 inches in length, and possess a green coloration. The plant is characterized by its robust and erect growth habit, displaying a rough texture in its foliage. Typically, it reaches a height ranging from 5 to 6 feet. The stems exhibit a significant amount of foliage, characterized by oval, medium-green leaves approximately 6 to 8 inches long. The *Acalyphas*, comprising more than 450 species distributed over tropical regions worldwide, represent the most extensive genus within the spurge family.⁴ Certain species are widely recognized in traditional medicine, whereas a limited number have been included in homeopathic pharmacopeias. *A. hispida* is indigenous to the South Pacific region but also thrives in tropical Asia, particularly in Malesia and Papuaia. The plant is commonly found in cultivation, especially as an indoor plant, and has been recognized with the prestigious Award of Garden Merit by the Royal Horticultural Society.⁵ The

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results revealed the presence of phenolics, saponins, hydroxyl anthraquinones, flavonoids, alkaloids, tannins, and glycosides in all the leaves. These substances have been documented to demonstrate therapeutic physiological action.^{6,7}

MATERIALS AND METHODS

Both authors thoroughly examined all studies and autonomously extracted all pertinent data. The most important objectives of the study were to collect data about the characteristics and properties of the plant species under investigation. The secondary outcomes of this study involved collecting data about the purported pharmacological activity of *A. hispida*.

Botanical Description

Habit

The plant is a little shrub that exhibits dioecious characteristics.

Leaves

The leaves exhibit a broadly oval shape with pointy tips, including serrated edges and a cordate base. They are predominantly green in color.

Inflorescence

The elongated, pendulous spikes or catkins exhibit a vibrant red hue and can reach 18 inches. These structures are composed of several little blooms.

Flowers

The plant exhibits dioecy, a botanical condition characterized by male and female blooms on distinct individual plants. The female flowers exhibit purple, vivid scarlet, or crimson hues and are arranged in dense clusters within velvety catkins. The flowers exhibit diminutive size, primarily comprising feathery pistils; however, they are densely clustered along the raceme, resulting in a fuzzy catkin reminiscent of a felines tail. The male blooms lack conspicuousness; hence, the cultivated ornamental plants exclusively comprise female specimens.

Fruits

A small capsule with three rounds, with white seeds.

Flowering and fruiting time

during the year, when the ambient temperature reaches a sufficiently high level.⁸⁻¹⁰

Cultivation Collections¹¹⁻¹³

Cultivation

A. hispida is predominantly cultivated as an indoor plant in containers. During the summer season, it is advisable to place the object in question in an environment where it can be exposed to the open air while being partially shaded. However, in September, it is recommended to relocate the object back indoors. The flowers are shown in Figure 1. Additionally, it is feasible to cultivate it inside a garden setting; however, this can only be achieved every year, necessitating the removal of the plant during the months of late September and October, followed by its transplantation into a suitable container. Place the object near a well-lit window, protecting it from direct

exposure to intense sunlight. Regularly moisten the object by spraying. Using soil abundant in organic content, supplemented with river sand, is deemed appropriate for potting. Typically, a combination of turf and leafy soil is blended in a 1:1 ratio, adding decomposed manure and sand. When cultivating plants in a garden setting, it is advisable to use healthy and well-drained soil.

Watering

The plant demands regular attention. Water is essential for maintaining soil moisture in both garden and potted environments. In the event of an elevated air temperature of precisely 28°C, it is advisable to apply water to both the plant and the surrounding atmosphere as a means to uphold optimal humidity levels.

Transplanting

It is generally recommended to transfer the plant to a fresh container during the spring season, utilizing the existing soil.

Reproduction

The plant undergoes propagation throughout March through semi-woody shoots in a favorable, warm environment. The cuttings are inserted into a substrate composed of a blend of peat and agropperlite. The temperature is regulated within the range of 20 to 22°C. The propagation of adult plants using air layering in spring, utilizing sphagnum as a medium, and maintaining adequate moisture is a viable method. The new plant undergoes pruning during the late winter and early spring seasons.

Location

Maintaining the plants in an environment characterized by diffused light is advisable. *Acalypha wilkesiana* is the only plant species that exhibits tolerance to moderate levels of direct sunlight.

Temperature

For the plant to thrive, it necessitates a minimum winter temperature ranging from 15 to 16°C. *A. hispida* has been seen to exhibit increased tolerance to high temperatures when subjected to partial shade conditions and high relative humidity.

Diseases and pests

Leaf spots might arise due to specific fungal diseases; however, the need for specialized treatment in such cases is infrequent. In the event of successful disease development, tsineba-based fungicides are employed. Galls, induced by insect bites, serve as detectable sites for the presence of leaves. The removal of the damaged components is deemed satisfactory. In order to manage the presence of oidium, a fungal disease characterized by the appearance of powdery spots on plant leaves, it is beneficial to employ treatments using sulfur-based preparations.

Acquisition

Potted plants in the early stages of growth can be acquired from establishments such as flower nurseries, gardening centers,

and flower stores. Select plants with a compact growth habit and glossy foliage, ensuring that the stems possess abundant foliage even in the lower regions.

Preliminary phytochemical screening

A. hispida is widely recognized in the field of traditional medicine. Its aqueous and methanolic extracts have undergone phytochemical screening, revealing the presence of several compounds such as flavonoids, phenolics, glycosides, saponins, phlobatannins, hydroxyanthraquinones, steroids, and triterpene alkaloids. The plant has been shown to contain several compounds, such as gallic acid, corilagin, triterpenoids, and flavonoids, including quercetin and kaempferol derivatives. These components demonstrate varying pharmacological and physiological actions. The moisture content, crude fat content, ash content, crude protein content, crude fiber content, and carbohydrate content of *A. hispida* leaves were determined to be 11.02, 6.15, 10.32, 13.78, 10.25, and 44.48%, respectively. The oils of *A. hispida* were found to contain several compounds. The composition of three monoterpenoids, namely citral (12.87%), neral (11.04%), and nonana (5.20%), is being discussed. The sample consists of three sesquiterpenoids, namely α -geranyl acetone (3.41%), α -bisabolene (3.25%), and 6, 10, and 14 trimethyl-2-penta decanone (13.43%). One fatty acid, specifically n-hexadecanoic acid, is present at a concentration of 14.69%. Table 1 shows phytochemical screening and the presence of different chemicals of plant *A. hispida*.¹⁴⁻¹⁶

Chemical constituent

The utilization of a plant species that possesses quercetageitin-7-arabinosylgalactoside, a flavonoid compound, has been extensively employed in the management of many infectious ailments.¹⁷

Traditional used

The plant is frequently used as a decorative element in outdoor and indoor settings. The leaves possess laxative and diuretic properties and have been traditionally employed in the therapeutic management of leprosy and gonorrhea. The foliage of *A. hispida* exhibits several biological activities, including cytotoxic, antibacterial, antileprotic, antimicrobial, and antifungal effects. It exhibits efficacy against vitiligo, coughs, oral ulcers, diarrhea, and epistaxis. *A. hispida* also demonstrates anti-inflammatory and antioxidant action. The bark root of *A. hispida* is used to treat lung ailments. The



Figure 1: Flowers of *A. hispida*¹⁶

Table 1: Taxonomical classification

<i>Scientific name</i>	<i>A. hispida</i>
Family	Euphorbiaceae
Common name	Chenille plant, red cat tail, red hot cat tail
Kingdom	Plantae
Order:	Malpighiales
Genus	<i>Acalypha</i>
Species	<i>hispida</i>

infusion derived from this plant's aerial components is used to manage infectious diarrhea and dysentery.¹⁸

Toxicity studies

The LD₅₀ value of *A. hispida* leaf extract is greater than 16 g/kg body weight, indicating a relatively low level of toxicity. A lack of substantial alteration is observed in body weight, clinical manifestations of poisoning, and blood biochemistry.¹⁹ The findings of this study indicate that the administration of *A. hispida* leaf extract at levels below 2 g/kg of body weight is considered safe.²⁰

Pharmacological Activity

Trypanocidal activity

The term “trypanocidal” refers to the ability to eliminate trypanosomes effectively. Trypanosomes represent a taxonomic group of unicellular parasitic flagellate protozoa. The study’s findings indicate that the aqueous extract derived from the leaves of *A. hispida* demonstrates trypanocidal effectiveness across various regimens and administration methods.^{21,22}

Antimicrobial and cytotoxic activities of leaves

The *A. hispida* extract was effective against several bacterial strains, such as *S. typhi*, *E. coli*, *S. sonnei*, *S. boydii*, *E. faecalis*, *S. agalactiae*, and *S. saprophyticus*. Because flavonoids and saponins are found in large amounts in *A. hispida*, their antibacterial properties likely come from these chemicals. The cytotoxicity of *A. hispida* was assessed using the brine shrimp test, and the findings indicate that the plant exhibited cytotoxic properties.^{23,24}

Antioxidant activities

The assessment of antioxidant capability involved the utilization of many methods, including DPPH free radical scavenging, Fe⁺² chelating ability, reducing power, NO scavenging, as well as the determination of total phenolic and total flavonoid content. The findings indicate that the extracts derived from *A. hispida* exhibited significant antioxidant properties, as evidenced by their ability to scavenge DPPH radicals.²⁵

Antiinflammatory

The anti-inflammatory effect was assessed using rat paw edema models generated by carrageenan and histamine. The extract from *A. hispida* showed a statistically significant capacity to reduce paw volume in rats, indicating its potential as an anti-inflammatory agent.^{26, 27} The phytochemical screening and

Table 2: Phytochemical screening and presence of different chemical of plant *A. hispida*²⁷

S. No	Compound	Ethyl acetate extract	Ethanol extract	Hydro alcohol extract	Aqueous extract	Methanol extract
1	Flavonoids	+	+++	+++	+++	++
2	Terpenoids	+	+++	+++	+++	+
3	Tannins	-	++	++	++	++
4	Anthocyanin	-	+++	+++	+++	+
5	Phenols	++	+++	+++	+++	++++
6	Glycosides	-	+	+	+	+
7	Amino acids	++	++	++	++	+++
8	Reducing sugar	+	+++	++	+	-
9	Sterols	++	+++	+++	+++	-
10	Phytosterols	+	+++	+++	+++	-
11	Saponin	++	+++	+++	+++	-
12	Carbohydrate	+++	+++	+++	+++	+++
13	Coumarin	-	++	+++	+++	-
14	Alkaloids	+	++	+	++	++

Highly present: +++; moderately present++; present+; absent -

presence of different chemical constituents in plant affecting various disease are shown in Table 2

Hypoglycemic effects

Diabetes mellitus (DM) is a metabolic condition characterized by deregulation in the metabolism of proteins, carbohydrates, and fats. Elevated blood glucose levels and decreased insulin production or effectiveness are distinguishing features of the diabetes mellitus. A study was conducted to assess the hypoglycemic effects of *A. hispida*. The findings indicated that the ethanol extract derived from the leaves of *A. hispida* may possess significant potential as a hyperglycemic drug. This action is believed to be mediated through the inhibition of α -glucosidase and α -amylase enzymes.²⁸⁻³⁰

Antifungal activity

Fungi are a type of microbe that can give rise to infectious diseases in the human population. A member of the *Candida* genus is among the fungi that can cause diseases. The antifungal properties of *A. hispida* extract were assessed using the agar diffusion method, employing disc paper as the medium for the diffusion of the extract. The study findings suggest that the methanolic extract derived from *A. hispida* exhibits antifungal properties against *Candida albicans*.^{31,32}

Antidiarrheal activity

The study aimed to assess the antidiarrhoeal properties of a combination of 70% hydroethanolic extracts derived from *A. hispida*, *A. nervosa*, and *A. fruticosa* in a rat model of castor oil-induced diarrhea. The findings demonstrated a correlation

between the dosage administered and the lengthened time it took for diarrhea to manifest, as well as a notable decrease in the frequency of diarrheal episodes and the number of animals displaying symptoms of diarrhea. Loperamide served as the standard pharmaceutical agent. The study's outcome is to claim that *A. hispida* possesses good antidiarrhoeal properties.^{33,34}

Antiulcer activity

A peptic ulcer is a pathological condition characterized by profound gastrointestinal tract erosion, affecting the entire mucosal layer and perhaps extending through the muscle mucosa. The extract derived from *A. hispida* exhibits significant antiulcer activity. The observed activity can be attributed to geranin and dehydroellagitannins within the plant.^{35,36}

Anti-leishmania

Leishmaniasis is a disease attributed to the protozoan parasite's infection of humans and animals. Due to their reliance on blood meals to produce eggs, infected female phlebotomine sandflies bite people and spread the leishmania parasite. A comparative investigation examining three species of *Acalypha* showed that only *A. hispida* exhibited anti-leishmanial action, as evidenced by an IC₅₀ value of 71.75 μ g/mL.^{37,38}

CONCLUSION

This review aims to assess the recent progress made in understanding the therapeutic properties of the plant *A. hispida*. The material contained within this review is derived from an analysis of the pharmacognostic, biological, and pharmacological characteristics of the plant. This will furnish comprehensive evidence on the utilization of *A. hispida* in the treatment of diverse ailments. The plant has been documented to possess a diverse array of phytochemical compounds, including saponins, flavonoids, glycosides, alkaloids, phenols, and steroids. These ingredients have the potential for developing novel pharmaceuticals that could prove beneficial in the treatment of various ailments. The pharmacological actions exhibited by *A. hispida* are primarily attributed to phytochemicals inside the plant. *Acalypha* species exhibit a broad distribution in several regions, including China, Africa, India, the Mascarenes Islands, and North and South America. These regions are home to numerous species of *Acalypha* that are valued for their medicinal properties and are also consumed as vegetables. Moreover, there are still other pharmacological activities of *A. hispida* that require evaluation. Additionally, it is necessary to conduct further inquiry in order to ascertain the precise mechanism of action behind the pharmacological activity of *A. hispida*.

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