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PHYTOCHEMICAL CONSTITUENTS AND PHARMACOLOGICAL ACTIVITIES OF *ACALYPHUS INDICA* LINN: A REVIEW

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ABSTRACT

Plants and there preparations have been used as medicine since ancient time. The Ayurveda and various ancient Indian literatures have evidence the use of plants for various disorders. *Acalypha indica L* is an erect annual herb with numerous long branches covered with soft hairs. According to the Siddha text, 'Pathartha Guna Chinthamani' (Page no: 179), *Acalypha* cures diseases of the teeth and gums, burns, toxins of Plant and mixed origin, stomach pain, diseases due to Pitha, bleeding piles, irritations, stabbing pain, wheezing, sinusitis and neutralizes predominance of the Kabha factor. In the traditional medicine the preparations from whole plants have been used to counter various diseases and disorders. The present review is therefore, an effort to give a detailed survey of the literature on its pharamacognosy, phytochemistry, pharmacological and traditional uses.

INTRODUCTION: Plants have been the major source of drugs in Indian system of medicine and other ancient systems in the world. The Indian tradition has an ancient heritage of traditional medicine. Indian traditional medicines based on various systems including Ayurveda, Siddha, Unani and Homeopathy. With the emerging worldwide interest in adopting and studying traditional systems and exploiting their potential based on different health care systems, the evaluation of the rich heritage of traditional medicine is essential.

This article is a sincere effort to compile the pharmacognosy and pharmacology of the plant and describe its potential. The plant *Acalypha indica* Linn. is commonly known as Indian *Acalypha* and it belongs to the family Euphorbiaceae, found in all parts of the tropics. This herbs found in fields and wastes places throughout the hotter parts of the world. The common names of *Acalypha indica* are Brennkraut (German), Alcalifa (Brazil) and Ricinela (Spanish).

It is known as 'Kucing galak and Rumput Lis-lis' in Malaysia, 'Rumput bolong-bolong' and 'Rumput kokosongan' in Java and 'Tam ye tuapa and Tam ye meao' in Siam. It is a common annual herb, found mostly in the backyards of houses and waste places throughout the plains of India. The plant has wide uses in the traditional medicines of various countries and reportedly possesses diuretic, purgative and Antihelmintic properties, besides being also used for bronchitis, asthma, pneumonia, scabies and other cutaneous diseases [1, 3].

ACALYPHA INDICA

Taxonomy:

Kingdom	:	Plantae
Class	:	Magnoliopsida
Order	:	Euphorbiales
Family	:	Euphorbiaceae
Subfamily	:	Acalyphoideae
Genus	:	Acalypha
Species	:	Acalypha indica Linn.

Morphological Characters: *Acalpha indica* Linn. is an annual erect herb 30-75 cm in height. Branches are numerous, long, ascending, finely pubescent. Leaves 2.5-7.5 by 2-4.5 cm, ovulate or rhombic ovulate, acute, or sub obtuse crenate serrate, glabrous thin, base cuneat some what 3 nerves, petiolate usually longer than the blade, slender, stipulate minute. Flower in numerous lax erect, elongated, auxiliary spikes, and cluster near the summit of the spikes, the females scattered, surrounded by a shortly pedunculate large leafy dentate cuneiform many nerves bract 6-8mm diameter. Ovary hispid, capsule small, quite concealed by the brat. Often only 1 seeded seed ovoid, smooth, pale brown, 1-2mm long [3].

Phytochemical Screening: The root and leaves of *Acalpha indica* Linn. was qualitatively assayed for the presence of Anthraquinones, Alkaloids, Catachols, Flavonoids, Phenolic compounds, Saponins, Steroids, Tannins, Triterpenoids. The result concluded the presence of Alkaloids, Catachols, Flavonoids, Phenolic compounds, Saponins, Steroids. Tannins, terpenoids and anthraquinone were not found in the root and the leaves extract [4].

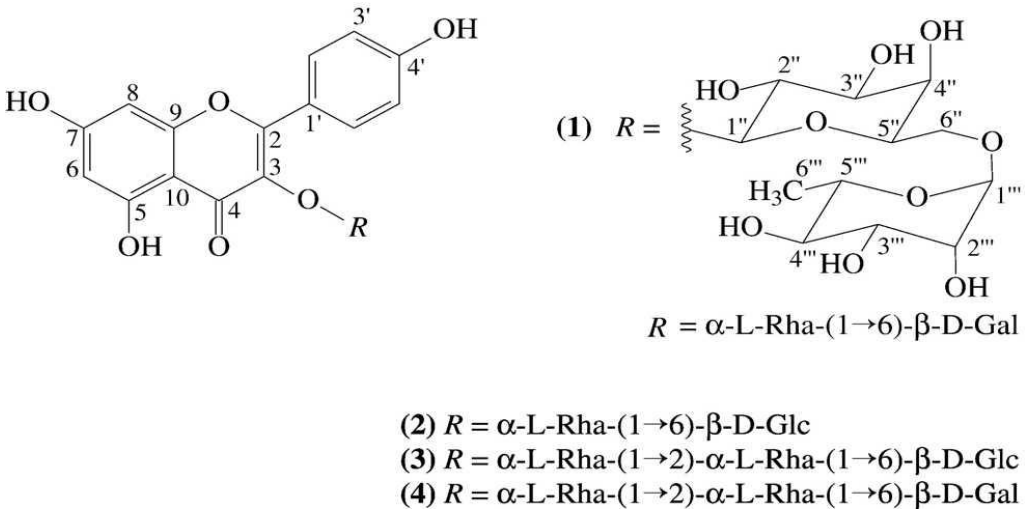

FIG. 1: ISOLATED COMPOUNDS [BIOROBIN (1), KAEMPFEROL DERIVATIVES NICOTIFLORIN (2), CLITORIN (3), MAURITIANIN (4)]

TABLE 1: QUALITATIVE ANALYSIS OF ROOT AND LEAF *ACALYPHA INDICA* L.

Compound tested for	Result
Anthraquinones	Not found
Alkaloids	Present
Catachols	Present
Flavonoids	Present
Phenolic compounds	Present
Saponins	Present
Steroids	Present
Tannins	Not found
Triterpenoids	Not found

Traditional Uses: Leaves possess laxative properties "are used as a substitute for senega", are used in the form of powder or decoction. Mixed with garlic they are used as Antihelmintic in worms. Mixed with garlic they are applied to scabies; and their juice mixed with oil forms an application in rheumatic arthritis. Expressed juice of the leaves is a safe, certain and speedy emetic for children in one teaspoonful doses, in cases of croup; in smaller doses it is expectorant, and is useful in chronic bronchitis, asthma and consumption. The decoction is employed in ear-ache as instillation and also as fomentation round the aching ear; and a cataplasm of the bruised leaves is applied to syphilitic ulcers, to maggot-eaten sores and also to relieve the

pain of snakebites. Extract of fresh leaves may be employed in scabies and other skin diseases, with lime and onion. It is a good stimulating application in rheumatism. Powder of dry leaves is used in bed sores. In congestive headache a piece of cotton saturated with the expressed juice of the plant or leaves and inserted into each nostril is said to relieve it by 'causing hemorrhage from the nose. In cases of obstinate constipation of children the leaves ground into a paste and made into a ball and introduced into the rectum, relax the sphincter and produces free motions. An infusion of the root or the root bruised in water, acts as a cathartic [3, 5].

Pharmacological Properties:

Analgesic Activity: The methanolic extract of *A. indica* L. showed significant analgesic activity in mice in a dose - dependent manner. Analgesic activity of the methanol extract was studied in mice by acetic acid induced writhing reflex method. Methanol extract at doses of 200 mg and 400 mg/kg body weight was used and was compared with the standard drug aminopyrine at a dose of 50 mg/kg body weight [6].

Anti-inflammatory Activity: Maximum inhibition by the methanolic extract was observed at 250 mg/kg body weight after three hours of ingestion, which was comparable to that of the standard drug phenylbutazone at a dose of 100mg/kg body weight. The anti-inflammatory activity also demonstrated in dose dependent manner [6].

Antihelmintic Activity: Antihelmintic potential was evaluated using alcoholic extract of root of *Acalypha indica* and *Pheretima posthuma* as test worm. Three concentrations (10, 25 and 50 mg/ml) of alcoholic extract and its various fractions were tested in the bioassay. Albendazole (10 mg/ml) was included as standard reference and distilled water as control. The results indicated that the alcoholic extract significantly demonstrated paralysis and also caused death of worms especially at higher concentration of (50 mg/ml) [7].

Anti bacterial and anti fungal activity: The ethanol extract of *Acalypha indica* showed maximum inhibition against *Bacillus cereus, Bacillus subtilis, Escherichia coli, Salmonella typhi, Vibrio cholera* and *Pseudomonas aeruginosa* but proved to be resistant against *Pseudomonas aeruginosa, Shigella flexneri, Staphylococcus aureus, Klebsiella pneumoniae, Vibrio cholerae* and *Bacillus cereus*. The ethyl acetate extract of *Acalypha indica* showed maximum inhibition against *Staphylococcus aureus, Klebsiella pneumoniae* and *Shigella flexneri* ethyl acetate was resistant to *Vibiro cholerae* and *Bacillus cereus*. *Pseudomonas aeruginosa* was resistant to ethyl acetate extract of *Acalypha indica.*

Another study proved that ethanol and water extract of leaves, stems, seeds and roots from *Acalypha indica* were effective against two bacterial *Escherichia coli* (Gram-negative bacterial), *Staphylococcus aureus* (Gram-positive bacterial) and for anti-fungal activity against three fungi, *Aspergillus fumigatus, Microsporum canis* (molds) and *Candida albican* (yeast). *Microsporum canis* showed dose-dependent sensitivity towards aqueous leaves and roots extract, but resistant to both ethanol and water stems, roots and seeds extracts. *Aspergillus fumigatus* and *Candida albican* were resistant to both ethanol and water extract of all *Acalypha indica* [8, 9].

Antitubercular Activity: Anti-tuberculosis activity was tested against five plants extract namely *A. indica, A. vasica, A. cepa, A. sativum* and *A. vera*. The resulted inhibition of these plants extract mentioned are 95, 32, 37, 72, 32 per cent, respectively for MDR isolate DKU-156 and 68, 86, 79, 72, 85 per cent, respectively for another MDR isolate JAL-1236, while for sensitive *M. tuberculosis* H37Rv, inhibition was found to be 68, 70, 35, 63 and 41 per cent, at 4 per cent v/v concentration in L-J medium. There was no inhibition against rapid grower *M. fortuitum* (TMC-1529). In BacT/ALERT also, extracts of these plants showed significant inhibition against *M. Tuberculosis* [10].

Antioxidant Activity: The Antioxidant activity of the extracts was analyzed by evaluating superoxide and hydroxyl radical scavenging activity and effect on lipid peroxidation. The ethanol extract showed significant antioxidant activity in all the free radical scavenging tests [11].

Molluscicidal activity; The molluscicidal activity was tested using *Lymnaea acuminata* as test animal. Ten experimental animals were kept in a glass aquarium.

Snails were treated with different conditions such as ethanolic extract, methanolic extract, distilled water extract, chlorinated water extract, Tap water extract containing 2 liters each and 5 mg fresh aerial plant extract.

Control group were provide with molluscicides. Toxicity was observed after 24 and 48 hrs. The weight of the ethanolic extract, methanolic extract, distilled water extract, chlorinated water extract, Tap water extract was taken as the final strength per liter of aquarium water. Dose dependent toxicity was observed against the test animals. The 24-hrs LC_{50} of the ethanolic extract of *R. communis* were higher in comparison to *A. indica* and *E. hirta* [12].

Neuro-protective and Neuro-Therapy Activity: The neuro-protection and neuro-therapy studies done on the frog. Frogs were dosed with 5, 10, 15, 20, 25 mg. Pancuronium bromide 0.2%, 4 mg, was used for a positive control as muscle relaxant. Neuroprotective study was done by ringer extract pancuronium bromide, and neuro-therapy study was ringer pancuronium bromide extract procedures. The parameters measured in these studies were the electrical activities such as amount and duration (second) of re-polarization, depolarization, resting potential, and the height of spike after electrical stimulation.

Neuro-protection effect of extract was determined by the ability of muscle to show the electrical response after incubating with pancuronium bromide for 10 minutes, and after incubating with extract for 10 minutes for neuro-therapy effect. In the dose of 15 mg and 20 mg/mL of *A. indica Linn*. Extract showed better activities than the dose of 25 mg of extract, both as neuro-protection and neuro-therapy effects [13].

Post-coital Antifertility Activity: Four successive solvent extracts of the whole plant Acalypha indica were tested for post-coital antifertility activity in female albino rats. Of these, the petroleum ether and ethanol extracts were found to be most effective in causing significant anti-implantation activity. The antifertility activity was reversible on withdrawal of the treatment of the extracts. Both the extracts at 600 mg/kg body weight showed estrogenic activity. Histological studies of the uterus were carried out to confirm this estrogenic activity [14].

Anti-venom Activity: Different extracts of *Acalypha indica* was used for the study. *In vitro* HRBC membrane stabilization properties of these extracts at concentrations ranging from 2-400µg/ml revealed inhibition of haemolysis induced by Russell's viper venom, in a concentration dependent manner. The neutralizing potency of different leaf extracts petroleum ether, benzene, chloroform and acetone extracts of *Acalypha indica* prepared by successive solvent extraction at intraperitoneal dose levels of 250, 500 and 750mg/kg revealed that the acetone extract possessed the most significant activity on venom-induced lethality [15].

Antiulcer Activity: Albino rats either sex ere used for the study of anti ulcer activity, provided food and water. Famotidine 20 mg/kg as a reference drug and 5ml/kg. Doses of 100and 200 mg/kg of *Acalypha indica* L. extract were prepared as aqueous suspensions. The anti-ulcer activity was done by two test procedures pylorus ligature and swim stressed induced ulcer. The methanolic extract showed significant reduction of gastric volume secretion, acidity and ulceration [16].

Post-coital Infertility Activity: The petroleum ether and ethanol extracts were found to have anti-implantation activity when they were given to female albino rats. This effect was reversible upon withdrawal of the treatment with the extracts. This effect is due to some estrogenic activity as evidenced by histological studies of the uterus [17].

CONCLUSION: The present study show the pharmacological study of the plant and various bio active compound responsible for it which have been reported. The whole plants have been used in traditional medicine for decades and the studies done yet have authentified the practice. Earlier as described the plant have been used in the Ayurveda, homeopathy and siddha medicine.

However, more clinical and pathological studies must be conducted to investigate the unexploited potential of the plant.

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