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Review Paper

A Pharmacological Potential of *Adina cordifolia*

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Abstract

Adina cordifolia belongs to the *Rubiaceae* family. Flavonoids, carbohydrate, alkaloid, saponin, phenol, tannins, terpenoids, and cardiac glycosides were found in *Adina cordifolia* plant extracts. Herbal medicines have been the highly esteemed source of medicine throughout human history. They are widely used today indicating that herbs are a growing part of modern, high-tech medicine. The medicinal plants, besides having natural therapeutic values against various diseases and considerable works have been done on these plants to treat chronic Cough, Jaundice, Stomachaches, Cancer, Diabetes, and a variety of other ailments. Present review deals with botanical description and various pharmacological action, and medicinal uses of *Adina cordifolia*.

Keywords: *Adina cordifolia*, Pharmacological Potential, Extract, Taxonomy.

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1. INTRODUCTION:

Taxonomical position:-¹

Table 1: Taxonomical Description of *Adina Cordifolia*

Class	Magnoliopsida
Sub-class	Asteridae
Super order	Gentiananae
Order	Gentianales
Family	Rubiaceae
Subfamily	Cinchonoideae
Genus	Adina
Specific epithet	Cardifolia
Botanical name	<i>Adina cardifolia</i>

Adina cordifolia belongs to the Rubiaceae family. Haldu is a common name for a variety of plants found in central and southern India, as well as Sri Lanka. The bark is aphrodisiac, tonic, vulnerary, and aphrodisiac; it is acrid, bitter, and

pungent.² Tannins, alkaloids, sugars, terpenoids, hormones, and flavonoids are some of the organic compounds found in medicinal plants that have a specific biochemical effect on the human body.³ Man learnt to seek medicines in the barks, roots, fruit bodies, and other aspects of the plants as a result of several years of battles against illnesses. The willingness of pharmacists and physicians to adapt to the problems that have arisen through the spread of specialized facilities in the facilitation of man's existence has improved as understanding of the growth of ideas relating to the use of medicinal plants as well as the evolution of consciousness has increased. Of the 7,000 medicinal plant species recognized around the world.⁴ Plants have therapeutic significance and they contain chemical compounds that have a specific physiologic effect on the human body. Anticancer, antibacterial, antiulcer, hepato-protective, anti-inflammatory, anti-diabetic, anti-amoebic, anti-nociceptive, and other biological functions have been isolated from different sections. Rheumatism, stomachache, headache, cold/cough, toothache, fever, discomfort and swelling, bacterial infection, urinary complications, conjunctivitis, infertility, and other illnesses have also been treated with this herb in the past.⁵

Table 2: Reported activity of *Adina Cordifolia*

Sr.No.	Part	Solvent	Activity	Reference
1	Leaf, Bark, root.	Methanolic	Antioxidant Activity	[6] [7] [8] [9]
2	Leaf and stem extracts.	Silver Nitrate	Anti-cancer Activity	[10] [11] [12]
3	Leaf and stem extracts	Silver Nitrate	Antibacterial activity	[13] [14] [15] [16]
4	Leaves.	Hydro-alcoholic	Anti-Diabetes activity	[17] [18] [19]
5	Bark extract.	Acetone (AEAC)	Hepatoprotective activity	[20] [21]
6	Bark extract.	Crude methanol	Cytotoxic activity	[22] [23] [24]
7	Root,Bark.	Benzene and ethyl acetate	Antiamoebic activity	[25] [26] [27] [28]
8	Root bark.	Petroleum ether and ethyl	Anti-inflammatory and Analgesic activity	[29] [30] [31]
9	Stem.	Chloroform	Anti-ulcer	[32]

2. PHARMACOLOGICAL POTENTIAL OF *ADINA CORDIFOLIA*

2.1 Antioxidant Activity:

Since ancient times, *Adina cordifolia* has been used in folk medicine.⁶ It is a medicinal plant used to cure chronic cough, jaundice, stomachaches, and a variety of other ailments. For the first time, methanolic extracts of leaf, bark, and root were subjected to various antioxidant assays, including radical scavenging, complete antioxidant, and polyphenolic content estimate.⁷ The leaf methanolic extract had the highest average antioxidant activity (1.430.087). The IC₅₀ values for DPPH radical scavenging activity and nitric oxide scavenging activity of methanolic extract of leaf were found to be 48.4 and 110.5 g/ml, respectively.⁸ The polyphenolic content of the methanolic extract of the leaf was also found to be higher. The active antioxidant compounds were found to be more abundant in the methanolic extract of the herb, indicating a clear connection between the total polyphenols derived and anti-oxidant behavior.⁹

2.2 Anti-cancer Activity:

The cytotoxicity of synthesized AgNPs against cancer cells was assessed using the colorimetric MTT assay. The NAD(P)H based oxidoreductases in a metabolically active cell convert absorbed MTT into unsolvable purple color formazan crystals.¹⁰ The susceptibility of MDA-MB-231 and PC-3 cells to AgNPs (20, 40, 60, 80, and 100lg/ml) prepared using leaf and stem extracts for 24 and 48 hours therapy revealed a substantial dose- and time-dependent increase in the reduction of viable cells compared to untreated cells (P 0.001). The leaf and stem extracts of *A. cordifolia*, on the other hand, showed no anticancer activity, implying that they are solely responsible for inducing nanoparticle synthesis. With the regression equation obtained from the percent cell death verses concentration graph, the IC₅₀ values for the prepared AgNPs of 48 h care were calculated.¹¹ When the IC₅₀ values of the AgNPs synthesized with the stem extract of *A. cordifolia* were compared, it was discovered that the AgNPs synthesized with the leaf extract had higher anticancer activity. Several studies have also shown that are synthesized by different methods have similar growth limiting effects against the currently tested cell lines. AgNPs cause cancer cells to produce reactive oxygen species, which destroys cellular components and causes cell death.¹²

2.3 Antibacterial activity:

Disk diffusion was used to analyze AgNPs' antibacterial potential, which showed an expanded and distinct zone of

inhibition (diameter in mm) in the presence of gram negative *E. coli* and gram positive *B. subtilis*. Person *A. cordifolia* leaf and stem extracts showed little zone of inhibition, indicating that they have no influence on the antibacterial effect.¹³ Isolated AgNPs made from *A. cordifolia* leaf and stem extracts, on the other hand, displayed distinct higher zones of inhibition, suggesting successful antibacterial activity. The 5, 10 mg AgNPs made with *A. cordifolia* leaf and stem extracts, as well as the positive control (10 mg Gentamycin), had significantly higher zone of inhibition values against *B. subtilis* than the untreated control (P 0.001). In addition to both leaf extracted AgNPs and the positive regulation, stem extracted AgNPs caused significantly higher values of zone of inhibition.¹⁴ The 5, 10 mg AgNPs made from *A. cordifolia* leaf and stem extracts, as well as the positive control (10 mg Gentamycin), displayed significantly higher zones of inhibition than the unprocessed control (P 0.001). Overall, the results show that stem-extracted AgNPs have better antibacterial activity than leaf-extracted AgNPs and the positive regulation. These findings were consistent with previous studies that demonstrated plant bark's antibacterial properties.¹⁵ AgNPs derived from *A. cordifolia* leaf and stem aqueous extracts have a smaller size and a higher surface to volume ratio, which may explain their close interactions with the microbial coating. AgNPs hinder bacterial cell growth by releasing silver ions that bind with the thiol groups of cellular enzymes. It's possible that AgNPs' superior antibacterial activity against gram negative bacteria is due to the presence of a thin, weak peptidoglycan coating that allows them to easily penetrate the bacterial cell wall.¹⁶

2.4 Anti-Diabetes activity:

HAEACL (hydro-alcoholic extract of *Adina cordifolia* (Roxb.) leaves) had anti-diabetic efficacy in alloxan-induced diabetic rats at doses of 250 and 500 mg/kg. Diabetes is a category of metabolic diseases characterized by hyperglycemia, impaired glucose, fat, and protein metabolism, and chronic complications such as microvascular, macrovascular, and neuropathic complications.¹⁷ Diabetes reportedly affects at least 171 million people globally, with the number expected to more than double by 2030. Furthermore, diabetes complications cause about 3.2 million deaths per year, or six deaths per minute.¹⁸ In addition to commercially available medicinal alternatives such as insulin, sulfonylureas, biguanides, thiazolidinediones, and others, several natural remedies have been prescribed for the treatment of diabetes due to their less side effects and improved acceptability. There are many plants that have been identified as having anti-diabetic properties in recent years.¹⁹

2.5 Hepatoprotective activity:

The acetone (AEAC) and aqueous extracts (AQEAC) of *Adina cordifolia*, a Rubiaceae plant, were investigated for hepatoprotective activity in Wister rats with ethanol-induced liver damage. At a dosage of 500 mg/kg body weight, AEAC and AQEAC were shown to have a hepatoprotective effect by significantly reducing serum Glutamate Pyruvate Transaminase (SGPT), Serum Glutamate Oxaloacetate Transaminase (SGOT), alkaline phosphate, and total bilirubin levels while also significantly increasing total protein levels.²⁰ Histopathological analyses of liver tissue backed up the hepatoprotective function. Since biochemical analyses of ethanol-treated rats' blood samples revealed a substantial rise in serum enzyme activities, reflecting ethanol-induced liver damage, and blood tests from animals treated with AEAC and AQEAC demonstrated a substantial reduction in serum markers, suggesting that hepatic cells were protected from ethanol-induced hepatocellular injury. The results of AEAC and AQEAC were similar to those of *silymarin*, a commonly used medicine.²¹

2.6 Cytotoxic activity:

The researchers looked into the cytotoxic, anthelmintic, and thrombolytic activities of *Holdina cordifolia* bark crude methanol extract in vitro. The brine shrimp lethality bioassay was used to assess cytotoxic activity, while counting paralyzed time and death time on the aquatic worm *Tubifex tubifex* was used to assess anthelmintic activity.²² The aim of the clot lysis operation was to assess thrombolytic activity. As compared to normal vincristine sulphate (0.825g/ml), the crude methanol extract of *Holdina cordifolia* bark demonstrated substantial cytotoxic potential (LC value = 236.68g/ml). In comparison to the normal drug levamisole, it also produced considerable anthelmintic activity in a dose-dependent manner.²³ The paralysis interval was 18 minutes and 06 seconds at the higher dosage of crude extract 20mg, but the death time was 14 minutes and 17 seconds. In the case of the normal medication levamisole, the paralysis interval was 3 minutes and 30 seconds, but the death time was 6 minutes and 50 seconds at a higher dosage of 1mg. It has significantly higher thrombolytic activity (51.57%) than normal streptokinase (80.51%). We concluded that bark has got the potential as a candidate for future antitumour, anthelmintic and *H. cordifolia* thrombolytic agent.²⁴

2.7 Antiamoebic activity:

Benzene and ethyl acetate extracts from the root bark of *Adina cordifolia* had good antiamoebic activity, with IC50 values of 2.92 and 2.50 mg/ml, respectively, in our quest for possible antiamoebic agents from folklore Indian medicinal plants.²⁵ 7-hydroxycoumarin (umbelliferone 1) and 7-b-D-glucosylcoumarin (skimmin 2) were isolated from benzene and ethyl acetate extracts using bioassay-guided fractionation. Umbelliferone 1 was transformed to 7-acetoxycoumarin 1a, which was then converted to 7-hydroxy-8-acetylcoumarin 2a after treatment with aluminum chloride.²⁶ A new sequence of thiosemicarbazones 3aee of 7-hydroxy-8-acetylcoumarin was synthesized with various thiosemicarbazides. Umbelliferone's methoxy derivative was also developed (7-methoxycoumarin 4). Following that, both of the compounds were tested for antiamoebic action against the *Entamoeba histolytica* strain HM1:IMMS. With IC50 values of 6.38 and 4.35 mM/ml, umbelliferone and skimmin were found to have very strong operation. The behavior improved dramatically as compound 2a was converted into its thiosemicarbazone derivatives 3aee, with IC50 levels ranging from 1.06 to 4.46 mM/ml.²⁷ Compounds 3b,c, and e, with IC50 values of 1.49, 1.56, and 1.06 mM/ml, respectively, had greater antiamoebic efficacy

than metronidazole (IC501 42.62 mg/ml). 7-methoxycoumarin had lower activity than umbelliferone (IC501 48.92 mM/ml). The toxicity of compounds 3b, c, and e was investigated using the H9c2 cardiac myoblast cell line. At 3.125e200 mg/ml, the compounds have a viability of >80%. These findings indicate that umbelliferone and skimmin may be a promising lead for the production of new antiamoebic drugs. All rights reserved, 2008 Elsevier Masson SAS.²⁸

2.8 Anti-inflammatory and analgesic activity:

The carrageenan influenced hind paw volume method and the tail flick method were used to test the anti-inflammatory and analgesic efficacy of petroleum ether and ethyl acetate extracts of *Adina cordifolia* bark, also known as Haldu.²⁹ At various doses (100, 200, and 400 mg/kg), petroleum ether extract showed significant (p 0.001) anti-inflammatory efficacy as compared to the control. The behavior of ethyl acetate extract at 400 mg/kg dose was similar to that of petroleum ether extract at the same dose, but it was lower.³⁰ Ethyl acetate extract at various doses (100, 200, and 400 mg/kg) and petroleum ether extract at 200 and 400 mg/kg doses all showed significant (p 0.01) analgesic efficacy as compared to the control. In all of the experimental models, extracts had dose-dependent effects. The extracts' anti-inflammatory and anti-nociceptive properties were compared to those of a normal prescription.³¹

2.9 Anti-ulcer:

The antiulcer capacity of *Haldinia cordifolia* stem has been studied. The active constituent 7-hydroxycoumarin was isolated from the chloroform extract using an enzyme assay and displayed interesting H⁺/K⁺ ATPase inhibitory activity.³²

3. CONCLUSION:

The current study focused on the *Adina cordifolia* plant family, Rubiaceae, with a focus on literature reviews of phytochemical and pharmacological studies on *Adina cordifolia* plants. After a detailed analysis and examination of the literature, it was discovered that little research has been done on this plant, especially on its leaves. *Adina cordifolia* has historically had a high demand due to its medicinal properties. This research aims to highlight the therapeutic value of *Adina cordifolia* and its constituents in disease prevention and treatment. We may infer from this analysis that the findings are intended to pique the interest of researchers looking for new drugs from *Adina cordifolia* and its chemical compounds. The isolated compounds will potentially be used in the future for more clinical evaluations and potential uses, as well as as adjuvants to existing drugs. We should continue to think about and value our natural heritage, as well as do further studies on *Adina cordifolia* and its pharmacological aspects. This article can point researchers in different directions, helping them to identify and use the therapeutic potential of these plants for public health.

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