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PHARMACOLOGICAL ACTIVITY OF *ADINA CORDIFOLIA:* A REVIEW

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ABSTRACT

Many medicinal plants are a rich source of medications that have been prescribed in several medical treaties for the treatment of various ailments, either separately or in combination. *Adina Cordifolia* (Roxb.) is a plant found in India, Ceylon, Thailand, and Burma, where it grows in mixed deciduous woods and is used by traditional healers to cure chronic cough, as well as jaundice, stomachache, appetite, and stomach swelling. The roots are astringent and constipating, making them effective in the treatment of diarrhoea and dysentery. The bark is aphrodisiac, tonic, diuretic, bitter, astringent, refrigerant, vulnerary, diuretic, demulcent, aphrodisiac, and aphrodisiac. It can help with pitta vitiation, wounds and ulcers, straangury, skin illness, gastropathy, fever, and a burning feeling. *Adina cordifolia* is reported in the literature as having a wide range of therapeutic purposes. It's been used before. Oleoresin, essential oil, cellulose, and sitosterol are chemical elements of Adina Cordifolia Root and Bark. *Adina cordifolia* bark powder was dried in the shade.

KEYWORDS

Adina cordifolia, Pharmacological activity, Antibacterial activity and Medications.

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INTRODUCTION

People nowadays rely on allopathic treatments more often, however microorganisms are developing resistant to these drugs. As a result, the emphasis is changing toward the utilisation of natural goods and therapeutic herbs, which were primarily employed in Ayurveda in ancient times. Because microbes are very sensitive to natural drugs and react at a very fast rate, antibacteial screening is used to find new therapeutic agents for infection and infectious disease. Because microbes are very sensitive to natural drugs and react at a very fast rate, the results come in a very short time[1]. The Rubiaceae family

includes *Adina cordifolia*. Haldu refers to a group of plants native to India's central and southern regions, as well as Sri Lanka. The caustic, bitter, and pungent bark is aphrodisiac, tonic, vulnerary, and aphrodisiac[2]. Tannins, alkaloids, sugars, terpenoids, hormones, and flavonoids are only a few of the organic components found in medicinal plants that have a biochemical influence on humans[3]. As a result of years of fighting ailments, man learned to look for remedies in the barks, roots, fruit bodies, and other parts of plants. As understanding of the growth of ideas relating to the use of medicinal plants as well as the evolution of consciousness has increased, pharmacists and physicians have become more willing to adapt to the problems that have arisen as a result of the spread of specialised facilities in the facilitation of man's existence. There are around 7,000 medicinal plant species identified worldwide[4]. Plants have chemical compounds that have a specific physiologic impact on the human body, and they have medicinal value. Different parts have been identified with anticancer, antibacterial, antiulcer, hepatoprotective, anti-inflammatory, anti-diabetic, anti-amoebic, anti-nociceptive, and other biological properties. This plant has also been used to treat rheumatism, stomachache, headache, cold/cough, toothache, fever, discomfort and swelling, bacterial infection, urinary problems, conjunctivitis, infertility, and other ailments[5].

Pharmacological activities

Antioxidant activity

Adina cordifolia has been utilised in traditional medicine from prehistoric times[6]. It is a medicinal herb that is used to treat chronic cough, jaundice, stomachaches, and other diseases. For the first time, methanolic extracts of leaf, bark, and root were exposed to a variety of antioxidant tests, including radical scavenging, total antioxidant, and estimation of polyphenolic content[7]. The antioxidant activity of the leaf methanolic extract was the greatest on average (1.430.087). The IC50 values of methanolic extract of leaf for DPPH radical scavenging activity and nitric oxide scavenging activity were determined to be 48.4 and 110.5g/ml, respectively[8]. The polyphenolic content of the leaf's methanolic extract was also discovered to be greater. The active antioxidant components were found to be more prevalent in the herb's methanolic extract, demonstrating a strong link between total polyphenols and anti-oxidant activity[9].

Anti-cancer Activity

The colorimetric MTT test was used to analyse the cytotoxicity of produced AgNPs against cancer cells. In a metabolically active cell, NAD (P) H-based oxidoreductases transform ingested MTT into insoluble purple hue formazan crystals[10]. The sensitivity of MDA-MB-231 and PC-3 cells to AgNPs (20, 40, 60, 80, and 100lg/ml) generated using leaf and stem extracts for 24 and 48 hours treatment demonstrated a significant dose- and time-dependent decrease in viable cells as compared to untreated cells (P 0.001). The *Adina cordifolia* leaf and stem extracts, on the other hand, revealed no anticancer effect, showing that they are primarily responsible for nanoparticle formation. The IC50 values for the generated AgNPs of 48 h care were estimated using the regression equation acquired from the percent cell death versus concentration graph[11]. When the anticancer activity of AgNPs synthesised with the stem extract of *Adina* cordifolia was compared to that of AgNPs produced with the leaf extract, it was revealed that the AgNPs synthesised with the leaf extract had a stronger anticancer activity. Several investigations have also found that are created using various techniques have comparable growth limiting effects on the cell lines that have been evaluated. Cancer cells create reactive oxygen species as a result of AgNPs, which damage biological components and trigger cell death[12].

Antibacterial activity

In the presence of gramme negative *E. coli* and gramme positive *B. subtilis*, disc diffusion was employed to assess AgNPs' antibacterial activity, which revealed an extended and distinct zone of inhibition (diameter in mm). *Adina cordifolia* leaf and stem extracts revealed negligible zone of inhibition, indicating that they had little effect on antibacterial activity[13]. On the other hand, isolated

AgNPs produced from *Adina cordifolia* leaf and stem extracts showed clear greater zones of inhibition, indicating effective antibacterial action. The zone of inhibition values of the 5, 10mg AgNPs prepared using *Adina cordifolia* leaf and stem extracts, as well as the positive control (10mg Gentamycin), were substantially greater than the untreated control against B. subtilis (P 0.001). In addition to the positive regulation of leaf-extracted AgNPs, stem-extracted AgNPs resulted in much greater zone of inhibition values[14]. The zones of inhibition of the 5, 10mg AgNPs produced from *Adina cordifolia* leaf and stem extracts, as well as the positive control (10mg Gentamycin), were substantially greater than the unprocessed control (P 0.001). Overall, the results reveal that stem-extracted AgNPs have stronger antibacterial activity and positive regulation than leaf-extracted AgNPs. These findings backed up prior research that showed plant bark had antibacterial capabilities[15]. AgNPs produced from aqueous extracts of *Adina cordifolia* leaves and stems are smaller and have a greater surface to volume ratio, which might explain their tight interactions with the microbial coating. By releasing silver ions that attach to the thiol groups of cellular enzymes, AgNPs inhibit bacterial cell development. AgNPs' higher antibacterial action against gram-negative bacteria might be owing to the presence of a thin, weak peptidoglycan covering that allows them to readily penetrate the bacterial cell wall[16].

Anti-Diabetes activity

At dosages of 250 and 500mg/kg, HAEACL (hydro-alcoholic extract of *Adina cordifolia* (Roxb.) leaves) demonstrated anti-diabetic effectiveness in alloxan-induced diabetic rats. Hyperglycemia, impaired glucose, lipid, and protein metabolism, and chronic consequences such as microvascular, macrovascular, and neuropathic problems are all characteristics of diabetes[17]. Diabetes is said to afflict at least 171 million people worldwide, with the figure anticipated to double by 2030. Furthermore, diabetic complications claim the lives of 3.2 million people each year, or six people every minute[18]. Several natural therapies have been given for the treatment of diabetes, in addition to commercially accessible pharmacological options such as insulin, sulfonylureas, biguanides, thiazolidinediones, and others, due to their less side effects and improved acceptance. In recent years, several plants have been found as having anti-diabetic effects[19].

Hepatoprotective activity

In Wister rats with ethanol-induced liver injury, the acetone (AEAC) and aqueous extracts (AQEAC) of *Adina cordifolia*, a Rubiaceae plant, were tested for hepatoprotective efficacy. At 500mg/kg body weight, AEAC and AQEAC were found to have a hepatoprotective effect by significantly lowering serum Glutamate Pyruvate Transaminase (SGPT), Serum Glutamate Oxaloacetate Transaminase (SGOT), alkaline phosphate, and total bilirubin levels while significantly increasing total protein levels[20]. The hepatoprotective activity was confirmed by histopathological studies of liver tissue. Biochemical analyses of ethanol-treated rats' blood samples revealed a significant increase in serum enzyme activities, indicating ethanol-induced liver damage, whereas blood tests from animals treated with AEAC and AQEAC revealed a significant reduction in serum markers, implying that hepatic cells were protected from ethanol-induced hepatocellular injury. AEAC and AQEAC produced outcomes that were similar to silymarin, a regularly used medication[21].

Cytotoxic activity

The cytotoxic, anthelmintic, and thrombolytic properties of *Holdina cordifolia* bark crude methanol extract were investigated in vitro by the researchers. The cytotoxic activity of the brine shrimp lethality bioassay was determined, whereas the anthelmintic activity of the aquatic worm Tubifex tubifex was determined by counting paralysed time and death time[22]. The purpose of the clot lysis procedure was to determine thrombolytic activity. The crude methanol extract of *Holdina cordifolia* bark showed significant cytotoxic potential (LC value = 236.68g/ml) when compared to standard vincristine sulphate (0.825g/ml). It also had significant anthelmintic action in a dose-

dependent manner when compared to the standard medication levamisole[23]. At the greater dosage of crude extract 20mg, the paralysis interval was 18 minutes and 06 seconds, however the death time was 14 minutes and 17 seconds. The paralysis interval for the common medicine levamisole was 3 minutes and 30 seconds, however at a greater dosage of 1mg, the death time was 6 minutes and 50 seconds. It has much stronger thrombolytic activity than regular streptokinase (51.57 percent) (80.51 percent). We concluded that bark has the potential to be used as an antitumor, anthelmintic, and H. cordifolia thrombolytic agent in the future[24].

Antiamoebic activity

In our search for putative antiamoebic drugs from traditional Indian medicinal plants, we found that benzene and ethyl acetate extracts from the root bark of *Adina cordifolia* displayed good antiamoebic activity, with IC50 values of 2.92 and 2.50mg/ml, respectively[25]. Bioassay-guided fractionation was used to separate 7-hydroxycoumarin (umbelliferone 1) and 7-b-Dglucosylcoumarin (skimmin 2) from benzene and ethyl acetate extracts. After treatment with aluminium chloride, umbelliferone 1 was converted to 7- acetoxycoumarin 1a, which was subsequently converted to 7- hydroxy-8-acetylcoumarin 2a.[26]. Using different thiosemicarbazides, a novel sequence of thiosemicarbazones 3aee of 7-hydroxy-8-acetylcoumarin was produced. The methoxy derivative of umbelliferone was also created (7-methoxycoumarin 4). The antiamoebic activity of both compounds was next evaluated against the Entamoeba histolytica strain HM1: IMMS. Umbelliferone and skimmin were shown to have very significant activity, with IC50 values of 6.38 and 4.35mM/ml, respectively. When compound 2a was transformed into its thiosemicarbazone derivatives 3aee, the behaviour improved substantially, with IC50 levels ranging from 1.06 to 4.46mM/ml[27]. Compounds 3b, c, and e demonstrated higher antiamoebic activity than metronidazole (IC501 42.62 mg/ml), with IC50 values of 1.49, 1.56, and 1.06mM/ml, respectively. The activity of 7-methoxycoumarin was lower than that of umbelliferone (IC501 48.92mM/ml). The H9c2 cardiac myoblast cell line was used to test the toxicity of chemicals 3b, c, and e. The compounds show a viability of >80% at 3.125e200mg/ml. These findings suggest that umbelliferone and skimmin might be useful as a starting point for developing novel antiamoebic medicines. Elsevier, 2008. All rights reserved[28].

Anti- inflammatory and analgesic activity

The anti-inflammatory and analgesic effectiveness of petroleum ether and ethyl acetate extracts of *Adina cordifolia* bark, popularly known as Haldu, were tested using the carrageenan-influenced hind paw volume technique and the tail flick method[29]. Petroleum ether extract demonstrated considerable (p 0.001) anti-inflammatory activity at various dosages (100, 200, and 400mg/kg) when compared to the control. At 400mg/kg dosage, the behaviour of ethyl acetate extract was comparable to that of petroleum ether extract, although it was lower[30]. When compared to the control, ethyl acetate extract at various dosages (100, 200, and 400mg/kg) and petroleum ether extract at 200 and 400mg/kg both demonstrated substantial (p 0.01) analgesic effectiveness. Extracts demonstrated dose-dependent effects in all of the experimental models. Anti-inflammatory and anti-nociceptive activities of the extracts were compared to those of a standard prescription[31].

Anti-ulcer

The antiulcer properties of the stem of *Haldinia cordifolia* have been investigated. Using an enzyme test, the active ingredient 7-hydroxycoumarin was extracted from the chloroform extract and showed remarkable H+/K+ ATPase inhibitory activity[32].

Figure No.1: ***Adina cordifolia***

CONCLUSION

The extracted chemicals might be employed as adjuvants to current medications in the future, as well as for additional clinical studies and prospective applications. We should keep thinking about and appreciating our natural heritage, as well as conducting more research on *Adina cordifolia* and its medicinal properties. This article can lead researchers in a variety of ways, assisting them in identifying and using the medicinal potential of these plants for public health. Natural products have always attracted the interest of the globe since they have less side effects, are more cost effective, and have a greater therapeutic impact. *Adina cordifolia* leaves were shown to have antimicrobial properties. Throughout human history, herbal remedies have been a widely respected source of medicine. Herbs are now frequently employed, demonstrating that they are becoming an increasingly important aspect of modern, high-tech medicine. Apart from possessing natural therapeutic benefits against a number of diseases, medicinal plants have been studied extensively for the treatment of chronic cough, jaundice, stomachaches, cancer, diabetes, and a variety of other disorders. The current review focuses on *Adina cordifolia's* botanical description, pharmacological activity, and therapeutic usage. Active antibacterial components were found in these plants. More research is needed to extract these active compounds, which might be used as an antibiotic source.

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CONFLICT OF INTEREST

The authors report no conflicts of interest in this work.

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