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Critical Review On "Investigating The Cardioprotective Potential Of Acalypha Wilkesiana: An Integrated Network Pharmacology And In Vivo Study"

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ABSTRACT

Acalypha wilkesiana was evaluated for its potential to control cardiovascular disease. Salt-loaded rat had changed serum parameters; extracts improved them. Acalypha wilkesiana leaves were studied for their cardiovascular effects in rabbits and rats. Extrct dramatically reduced blood pressure and cardiac contraction rate. Acalypha wilkesiana extract lowers cyanide-induced hepatotoxicity in rats. Significant improvements in liver enzyme and protein levels were found. Acalypha wilkesiana has antihyperglycemic properties in diabetic rats. The extract enhances pancreatic and splenic health in treated mice. The results showed that alloxan administration significantly raised oxidative stress indicators and produced pathological alterations in the liver and kidney compared to the control group. However, treatment with Acalypha wilkesiana extract corrected these alterations in a dose-dependent way, indicating that it has the ability to serve as an antioxidant and protect against oxidative stress-induced tissue damage.

KEYWORDS *Acalypha wilkesiana, hepatotoxicity, Euphorbiaceae, Copperleaf, doxorubicin*

INTRODUCTION

This critical review will examine the latest paper titled "Investigating the Cardioprotective Potential of Acalypha wilkesiana: An Integrated Network Pharmacology and In Vivo Study." Cardiovascular diseases (CVDs) remain a primary cause of morbidity and mortality globally, necessitating ongoing research into innovative treatment techniques, particularly those derived from natural sources. Acalypha wilkesiana, a plant known for its therapeutic characteristics, has received attention for its possible involvement in treating a variety of illnesses.

The current study uses a dual strategy to investigate the cardioprotective mechanisms of Acalypha wilkesiana, integrating sophisticated network pharmacology with in vivo experiments. Network pharmacology provides a comprehensive view of drug action by identifying many targets and pathways, whereas in vivo investigations give critical confirmation in a biological setting. This review will critically analyze the authors' methodology, results, and conclusions, evaluating the strength of their findings, the suitability of their integrated strategy, and the implications for future research in phytomedicine and cardiovascular health.

LITRETURE REVIEW

1. Kingsley Omage (2018) "Evaluation of the efficacy of Acalypha wilkesiana leaves in managing cardiovascular disease risk factors in rabbits fed salt-rich diets". The study provides scientific evidence to support the traditional use of Acalypha wilkesiana leaves in the management of cardiovascular disease risk factors, demonstrating that oral administration of its extracts can significantly improve serum parameters such as increasing HDL-cholesterol and globulin levels while lowering LDL-cholesterol and total cholesterol in salt-loaded rabbits. The study highlights Acalypha wilkesiana's potential as a therapeutic agent for addressing the negative effects of excessive dietary salt intake, which has been linked to cardiovascular disease, by demonstrating its ability to reduce hypertriglyceridemia and improve lipid profiles, thereby contributing to our understanding of natural remedies in cardiovascular health management [1].

2. Chinonye Blessing Ejekwurunwa (2024) "The effect of ethanolic Acalypha Wilkesiana extract on blood sugar, sodium, potassium levels in alloxan-induced diabetic and salt-induced hypertensive Wistar rats". The administration of ethanolic Acalypha Wilkesiana (EAW) extract resulted in a substantial drop in blood glucose levels and a rise in insulin levels in the treated groups compared to the positive control group, indicating that it has the potential to help manage diabetes. EAW delivery also resulted in lower sodium ion levels and higher potassium ion levels across all treatment groups, indicating that EAW may aid in electrolyte balance in the setting of hypertension and diabetic problems [2].

3. **Christopher Larbie (2020)** "Acalypha wilkesiana 'inferno' hydroethanolic leaf extract has protective effect on carbon tetrachloride-induced subacute toxicity in animals". This research paper, titled "Acalypha wilkesiana 'inferno' hydroethanolic leaf extract has protective effect on carbon tetrachloride-induced subacute toxicity in animals," investigates the hepatoprotective and anti-inflammatory properties of *Acalypha wilkesiana* 'inferno' (AWE) extract against carbon tetrachloride (CCl4)-induced subacute liver toxicity in animals. Liver fibrosis is a significant clinical manifestation of hepatic diseases, leading to approximately 2.4 million deaths annually, globally. Despite the availability of numerous synthetic drugs, liver injuries continue to be a persistent health concern. *Carbon tetrachloride* (CCl4) is a well-established hepatotoxin commonly used in liver inflammation, fibrosis, and cirrhosis studies. Its toxicity stems from the generation of highly reactive trichloromethyl radicals upon metabolism, which induce oxidative stress and cellular damage. This has led to increasing interest in traditional herbal formulations as potentially safer, cheaper, and more accessible alternatives to synthetic drugs. *Acalypha wilkesiana* 'inferno' (copperleaf), an ornamental plant, has shown antioxidant, bactericidal, and nephroprotective activities in previous studies, with its hydroethanolic extract containing beneficial compounds such as triterpenoids, alkaloids, flavonoids, glycosides, coumarins, sterols, and hydrolysable tannins. This study aimed to evaluate the subacute hepatoprotective effects of AWE against. CCl4-induced toxicity in animals, focusing on biochemical, histological, non-invasive anti-fibrotic, and inflammatory assessments.[3]

4. S.W. Lima (2011) This article, "Acalypha wilkesiana extracts induce apoptosis by causing single strand and double strand DNA breaks," investigates the anticancer properties of Acalypha wilkesiana extracts against brain and lung cancer cells. This research is ethnopharmacologically relevant as traditional healers in Southwest Nigeria have empirically used Acalypha wilkesiana seeds to treat breast tumors and inflammation.

The study examined the antiproliferative activity of ethyl acetate, hexane, and ethanol extracts of Acalypha wilkesiana on human glioma (U87MG) and human lung carcinoma (A549) cells, as well as normal human lung fibroblast (MRC5) cells. Cell viability was assessed using the MTT assay, and DNA damage (single strand breaks (SSBs) and double strand breaks (DSBs)) was determined using the single cell gel electrophoresis (SCGE) comet assay, supported by Haematoxylin & Eosin (H & E) staining for morphological changes.[4]

5. **Olubodun (2024)** This article, "Acalypha wilkesiana Leaf Extracts Influence Heart Disease Risk Factors in 1,2-Dimethylhydrazine (DMH)-induced Rats," investigates the impact of ethanol leaf extract of Acalypha wilkesiana on serum markers associated with heart disease risk in rats induced with 1,2-dimethylhydrazine (DMH). The study involved male albino rats divided into six groups: a control group, a DMH control group, a group treated with Xeloda (a standard drug), and three groups treated with graded doses (200, 400, and 800 mg/kg body weight) of the Acalypha wilkesiana extract. DMH was subcutaneously administered to induce colorectal tumorigenesis, which also affects cardiovascular parameters. Key serum markers evaluated included LDL-cholesterol, total cholesterol, VLDL-cholesterol, triglycerides, HDL-cholesterol, glucose, and total protein . Results showed that DMH treatment significantly increased LDL-cholesterol, total cholesterol, and VLDL-cholesterol, while decreasing triglycerides and HDL-cholesterol, indicating increased heart disease risk. Treatment with Acalypha wilkesiana leaf extract resulted in a dose-dependent elevation of total cholesterol, HDL-cholesterol, and triglycerides, but a reduction in LDL-cholesterol, glucose, and total protein when compared to the DMH control group. Interestingly, Xeloda did not significantly alter lipid concentrations compared to the DMH control. While the extract significantly altered some risk factors, it also increased total cholesterol and triglycerides, which are also risk factors.[5]

6. Muyideen T. Haruna (2012) this article, "Antibacterial and Antifungal Activity of *Acalypha wilkesiana*," investigates the antimicrobial properties of the methanolic extract and four derivative fractions (aqueous, ethyl acetate, hexane, and chloroform) from *Acalypha wilkesiana* leaves against various human pathogenic bacteria and fungi. The study utilized standard microbiological techniques, including the disc diffusion method for screening and determination of Minimum Inhibitory Concentration (MIC) for both bacteria and fungi. The tested microorganisms included Gram-positive bacteria (e.g., *Staphylococcus aureus*, *Streptococcus pyogenes*, *Enterococcus faecalis*) and Gram-negative bacteria (e.g., *Pseudomonas aeruginosa*, *Proteus vulgaris*, *Escherichia coli*, *Klebsiella pneumoniae*). Fungi tested included *Aspergillus niger*, *A. flavus*, *A. carbonerium*, *Trichophyton mentagrophytes*, and *Candida albicans*.[6]

7. Tehseen Quds (2012) This article, "Antiemetic activity of Acalypha fimbriata Schumach. & Thonn., Acalypha ornata Hochst., and Acalypha wilkesiana cv. godseffiana Muell Arg.," investigates the antiemetic effects of methanolic extracts from the aerial parts of these three Acalypha species. The study aimed to scientifically validate their traditional folk use in gastrointestinal disorders, particularly their ability to alleviate vomiting. The research employed a chick emesis model, where emesis (vomiting) was induced by the oral administration of copper sulfate to male chicks. The chicks were pre-treated with various doses of the plant extracts to observe their antiemetic potential. Chlorpromazine was used as a standard reference drug for comparison. Key findings revealed that all three Acalypha species exhibited significant antiemetic activity, reducing the number of emetic episodes in a dose-dependent manner. Among them, Acalypha wilkesiana cv. godseffiana demonstrated the most potent antiemetic effect, comparable to the standard antiemetic drug chlorpromazine, while Acalypha fimbriata also showed strong activity. Acalypha ornata displayed moderate antiemetic properties.[7]

8. Katibi Oludolapo Sherifat (2021) this research paper, "Anti-Fungal Activity Of Acalypha Wilkesiana: A Preliminary Study Of Fungal Isolates Of Clinical Significance," investigates the antifungal properties of Acalypha wilkesiana (AW) extracts and formulated creams against several clinically significant fungal isolates.

The study aims to determine the spectrum of antifungal activity of two variants of Acalypha wilkesiana as a preliminary step for potential clinical trials in humans.[8]

9. Johnny O. Olukunle (2015) This study investigated the anti-inflammatory and analgesic properties of methanol extracts and fractions from Acalypha wilkesiana leaves in experimental animals. The methanolic extract of A. wilkesiana significantly reduced paw edema in rats, with a 74.1% inhibition, comparable to the standard anti-inflammatory drug indomethacin (85.7%). Notably, a chloroform fraction at a lower dose showed even higher inhibition (93%), surpassing both indomethacin and aspirin. The extract demonstrated analgesic effects by increasing reaction time in the hot plate test and significantly reducing the number of acetic acid-induced writhings in mice. While its analgesic effect was strong, it was slightly less potent than paracetamol in the writhing test. The study suggests that Acalypha wilkesiana leaves possess considerable anti-inflammatory and analgesic potential, comparable to some standard drugs, thus supporting its traditional medicinal use for pain and inflammation. Further research is recommended to explore its mechanisms of action and therapeutic applications. [9]

10. Iyekowa et al (2016) This study investigated the antimicrobial activities of *Acalypha wilkesiana* (Red Acalypha) extracts against several selected skin pathogens. The plant leaves were extracted using distilled water, hexane, and methanol, and subjected to phytochemical screening and GC-MS analysis of the hexane extract. Phytochemical screening revealed the presence of glycosides, terpenes, and alkaloids in the extracts. GC-MS analysis of the hexane extract identified major components such as 15-hydroxy pentadecanoic acid, 1,2,3-propanetriyl ester 9-octadecanoic acid (an unsaturated fatty acid), and cholesterol. The antimicrobial analysis showed zones of inhibition for the aqueous extract against. *Escherichia coli* (12.5mm), *Pseudomonas aeruginosa* (17.8mm), *Proteus vulgaris* (15.6mm), *Staphylococcus aureus* (18.5mm), and *Candida albicans* (16 mm) at a concentration of 1000 mg/ml. Hexane and methanol extracts exhibited dose-dependent activity compared to the standard antibiotic ciprofloxacin. The methanol extract displayed the highest significant activity on all tested organisms, with inhibition zones ranging from 10.50-23.00 mm.[10]

11. S. K. ADESINA *ET AL. (2000)* This paper investigates the antimicrobial constituents present in the leaves of Acalypha wilkesiana and Acalypha hispida. The study identified several antimicrobial compounds from the leaves of both Acalypha species. The genus Acalypha comprises approximately 570 species, many of which are recognized in traditional medicine. Specifically, A. wilkesiana leaves are traditionally used to treat skin infections like Pityriasis versicolor and Tinea, while A. hispida leaf decoctions are applied to wounds, ulcers, abscesses, and as a compress for leprosy. Despite their traditional importance, limited chemical investigations had been conducted prior to this study. Preliminary antimicrobial screenings in the authors' laboratory against various bacteria (E. coli, Ps. aeruginosa, B. subtilis, S. aureus) and yeast (C. pseudotropicalis) further encouraged this research to isolate and identify the active antimicrobial principles.[11]

CONCLUSION

Acalypha wilkesiana has been explored for its potential benefits across several health conditions. Studies show it can help manage cardiovascular disease; in rats with high salt intake, its extracts improved various blood parameters. Further research on rabbits and rats specifically focusing on cardiovascular effects revealed that Acalypha wilkesiana leaf extract significantly lowered both blood pressure and heart rate.

Beyond cardiovascular health, Acalypha wilkesiana extract has also been found to reduce liver damage caused by cyanide in rats, leading to notable improvements in liver enzyme and protein levels. It also demonstrates antihyperglycemic effects in diabetic rats, promoting better pancreatic and splenic health in treated mice.

Furthermore, experiments with alloxan-induced diabetic rats, which typically show increased oxidative stress and liver and kidney damage, demonstrated that Acalypha wilkesiana extract effectively reversed these

negative changes in a dose-dependent manner. This suggests that the plant acts as a powerful antioxidant, protecting tissues from damage caused by oxidative stress.

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