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Pharmacological Importance of *Chromolaena odorata*: a review

Angitha Ajay¹, Rupesh Kumar M¹, Shamal Badhusha PA¹, Blainy Baby¹, Abhishek K¹, Sanjay K Gowda¹, B Ramesh².

¹ Department of Pharmacology, Sri Adichunchanagiri College of Pharmacy.

² Department of Pharmaceutical Chemistry, Sri Adichunchanagiri College of Pharmacy, Adichunchanagiri University, B. G Nagara, Mandya-571448, India.

Article History	Abstract
<p>Received on: 16-11-2020 Revised On : 13-02-2021 Accepted on : 16-02-2021</p>	<p><i>Chromolaena odorata</i> (Asteraceae) is commonly referred to as Siam Weed, a major medicinal plant found in tropical Asia, Australia, and West Africa. The medicinal use of <i>Chromolaena odorata</i> had been documented in the conventional system such as the Siddha, Unani, Ayurveda. The pharmacological properties of this plant are widely varying. A wide variety of attractive but limited compounds were extracted from this <i>Chromolaena odorata</i> and the pharmacological activities were screened out. This review the various properties of <i>Chromolaena odorata</i> and focus on its various medicinal properties. It is an attractive subject for further experimental and clinical investigations. This article will give an exhaustive summary and analysis of <i>Chromolaena odorata</i> pharmacological activities. The present article including the detailed exploration of pharmacological properties of <i>C. odorata</i> is an attempt to provide a direction for further research.</p> <p>Keywords: <i>Chromolaena odorata</i>, Ethanopharmacological activities, Phytoconstituents.</p>
<p>*Corresponding Author Rupesh Kumar M E mail: manirupeshkumar@yahoo.in Contact: +91-7348828206</p>	
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Introduction

Chromolaena odorata one of the world's worst tropical weeds. It is a member of the tribe Eupatridae in the sunflower family *Asteraceae*. The herb goes hand in hand with many common names, including French weed, Siam marijuana, devil weed, communist weed, agony, etc. Originating from South America was *Chromolaena odorata* also called *Eupatorium odoratum*. It's a popular Weed now. *C. odorata* is a perennial semi-woody shrub [1]. *C. odorata* is a woody-stemmed shrub that can develop up to 2.5m tall. It is hairy and glandular. It also has soft stems with a woody base and behaves like creepers in shady areas. The leaves of *C. odorata* measures about 10cm x 5cm in their widest dimension. The plant produces leaf petioles that are 1 – 4 cm in length. The white to pale pink tubular flowers are panicles of 10 – 35 flowers that form at the ends of branches. *C. odorata* can produce 80,000 – 90,000 seeds that are wind pollinated [2]. The natural vary of *Chromolaena odorata* ranges from northern Argentina. (USA) to Florida (USA). *Chromolaena* could be a major weed from western, central, and southern Africa

to the Asian nation, Southern China, Laos, Sri Lanka, Cambodia, Bangladesh, Thailand, Taiwan, Indonesia, etc[1]. The focus of the article is to offer an in-depth analysis and outline of the phytoconstituents and activity of *Chromolaena odorata*.

Traditional uses

Chromolaena odorata is used in the treatment of skin infections, burns, wounds. Traditionally, leaves of *C. odorata* need for the prevention of leech attack, liver disease, soft tissue wounds, fire wounds in tropical countries [4]. The herb is employed by traditional health caregivers in the treatment of many ailments, especially for dysentery, headache, and toothache. Traditionally in some communities of Africa, local dwellers apply crush leaves of *C. odorata* on fresh wounds to facilitate healing [4]. Boiling of the herb is employed as a cough reliever in ancient drugs, and as an ingredient with lemongrass and guava leaves for protozoal infection treatment. Other traditional medicinal uses include antibacterial, anti-stress, anticancer, anticonvulsant, antidiabetic,

antidiarrheal, antifungal, anti-inflammatory, antioxidant, antiparasitic, hemostatic, wound healing, and hepatoprotective [3].

Phytoconstituents

The leaf of *Chromolaena odorata* contains carbohydrates (31%), crude protein (18%), fiber (15%), crude fat (15%), ash (11%), moisture (15%). The phytochemical active substances are:

1. Essential oils
2. Flavonoid aglycones (flavanones and flavanol) as well as quercetagenin, kaempferol, acacetin, naringenin, chalcones, quercetin, luteolin, and sinensetin.
3. Terpenes and terpenoids 4. Saponin and tannins [3]
4. Organic compound as well as pyrrolizidine
5. Phytoprostane compound
6. Phenolic acids [3]

The nutritional elements of *C. odorata* include; macromolecule, protein, lipid, ash, water, and a high concentration of fiber [2]. The mineral part elements ascertained by the scientist including Ca, sodium, potassium, iron, magnesium, manganese, zinc, copper, and element. The bioactive ingredients contents of *C. odorata* including alkaloids, flavonoids, saponins, cyanogenetic glycosides, tannins, and phytic acid [2].

Pharmacological activity

Antimicrobial activity

The antimicrobial activity was evaluated in the experiment conducted by the Srisuda Hanphakphoom et al, root, leaves, and stem of *C. odorata* were extracted by maceration extraction technique victimization water, ethanol, fuel, and dissolver as solvents. The average proportion yield of leaf extracts in water, ethanol, methyl alcohol, and alkane was considerably higher compared with stem and root extracts exploitation identical solvents. All extracts were tested for antimicrobial activity against 10 microorganism strains related to human skin infections. The extract of *C. odorata* has an anti-microbial activity which is related to the number of each total synthetic resin and flavonoid compounds the results obtained recommend that extracts of ethanolic, methanolic, and dissolvent leaf can be developed to treat infections of the microorganism skin. The dissolvent was an efficient solvent for separating the root and stem sections of *C. odorata*. Leaf extracts delivered considerably higher yields than stem and root extracts for all solvent-extraction. The water and methanol solvents showed significantly higher yields for the plant leaf and stem relative to the other extraction solvents but not the root. *Chromolaena odorata* gained a low yield. Also, the hexane solvent yielded significantly lower for all plant components compared to water, ethanol, and metabolism [6].

Anti-oxidant activity

Research work on the ethanolic and methanolic extract of plant *C. odorata* leaves by Bhargava et al., was tested for antioxidant function and free radical scavenging. The extract's ability to scavenge nitric oxide, hydroxyl radical, and 1,1-diphenyl-2-picrylhydrazyl (DPPH) was used in this study to determine its anti-oxidant property. For ethanolic extract, methanolic extract and vitamin C, the DPPH radical inhibition (percent) was there. Furthermore, ethanol and methanol extract also demonstrate extensive radical scavenging of nitric oxide and hydroxyl radicals. The leaves methanolic and ethanol extract reveals the drug's anti-oxidant effects. The extract's free radical scavenging behavior was tested based on its capacity to scavenge the DPPH. This method is particularly important to provide details on the reactivity of organic compounds with stable free radicals due to the unusual number of electrons. The research result shows that the leaves of *Chromolaena odorata* have ethanolic content. DPPH system scavenged free radicals by *odorata* (L). It shows a robust color spectrum, optical phenomena (deep violet color) at 517 nm. The DPPH absorption bleaching indicates the power of the test drugs to free radical scavenging [7].

Analgesic activity, Anti-inflammatory, and Antipyretic activity In separate laboratory models, Bamidele Victor Owoyele tested the drug extract's pharmacological function. *Chromolaena odorata* ethanol extract was separated with the solvent-solvent extraction technique using successively the subsequent solvents: n-hexane, dichloromethane, ester, n-butanol, and water. Fractions were tested for these activities using normal laboratory models including hot plate and formalin paw licking experiments for carrageenan paw edema, analgesic activity, and cotton pellet granuloma for anti-inflammatory activity and Brewer's yeast mediated pyrexia for antipyretic research. The fractions of n-butanol, dichloromethane, and ethyl acetate were analyzed using analytical thin-layer chromatography, thin-layer preparatory chromatography (PTLC). The outcome shows that significant effects were developed by the dichloromethane followed by the ethyl acetate and n-butanol. Using *male Wistar rat* for study. The findings of the hot plate test show that only the fractions of nBF and DCF provided a strong, significant increase in reaction time to the thermal stimuli. Likewise, in the formalin-induced paw licking test, only the n-butanol and dichloromethane showed a remarkable decrease in paw licking time. In the paw edema induced by carrageenan, only the fractions ethyl acetate, dichloromethane, and aqueous produced a consistent reduction of the paw size after 3h and 5 h of carrageenan injection. In the cotton pellet granuloma test, all the fractions produced a significant reduction in granuloma weight but the highest inhibition of granuloma formation was produced by the aqueous followed by the DCF. In the antipyretic study, the n-butanol and dichloromethane were the only fractions

that produced significant reductions within the average temperature at which rectal temperatures were measured [8].

Antidiarrheal activity

The researcher Mayela Nkouka S.H.J assess the antidiarrheal activity of the aqueous extract of *C. odorata* leaves. The antidiarrheal effect was assessed for diarrhea induced by the castor oil, the charcoal test (intestinal transit time), and the accumulation of the castor oil-induced intestinal fluid. The results obtained show that the aqueous extract at the doses used significantly reduces the emission frequency, the amount, and the appearance of the faces induced by the castor oil. The aqueous extract of *C. odorata* does not significantly decrease the intestinal movement but on the other hand, greatly reduces the concentration of fluid in the castor oil mediated intestine. *C. odorata* aqueous extract has an antidiarrheal effect which could be explained by interfering with the electrolyte secretion mechanisms. These results would support the use of the plant in conventional diarrhea therapy. Albino rat and albino mice of both sexes are used for evaluation of this behavior [9].

Cytoprotective activity

The experiment conducted by Nurjannah *et al.*, 2006, proved their effectiveness as an antiulcer when used orally. For this study, *C. Odorata* extract was provided for use in the treatment of stomach ulcer lacerations in conjunction with honey. Extract of the *odorata* was also done. Such tests have shown the presence in the extract of a variety of compounds such as acacetin and luteolin. Such mixtures have demonstrated themselves for their important action against small human breast cancer and lung cancer [3].

Anti-diabetic activity. The study, conducted by Oluyemisi Omotayo Omonije *et.al*, therefore examines the anti-diabetic activities of the *Chromolaena odorata* methanolic extract. The extract also enhances glucose transport in a dose-dependent manner. There was a substantial dose-dependent rise of whole root extract of *Chromolaena odorata* methanol in *in-vitro* anti-diabetic practice. This inhibitory activity of the extract might be attributed to the presence of phytochemical antioxidants including; flavonoids, tannins, and saponins that are reported to inhibit α -amylase activity and thus protect the β -cell integrity from the event of type 2 diabetics with insulin resistance [4].

Wound healing

The facets of *Chromolaena odorata* that are most known and explored are its role in wound healing properties. Pandith Hataichanok *et. Al*, (2009), researched the molecular mechanisms by which the hemostatic and wound healing behaviors were influenced by Siam weed extract (SWE). SWE encouraged Balb / c 3T3 fibroblast cell migration and proliferation. Subsequently, the accelerated

wound healing enzyme, heme oxygenase-1(HO-1) was increased by SWE treatments at the translation and transcription rates. Additionally, the promoter HO-1 examined with assay was increased depend on dose manner by SWE therapy. As a result, SWE measured the enhancement of hantatic and wound healing events by modifying gene expression [10].

Anthelmintic activity

Helminth infection is currently the most widespread infection found in human beings. They pose a significant threat to the population of the world which leads to starvation, anemia, eosinophilia, and pneumonia. The gastrointestinal helminths are immune to anthelmintic medicines currently available, so there is a major threat in the treatment of helminth diseases, hence a growing demand for natural anthelmintic. Consequently, the present research carried out by Debashisha Panda *et.al*, (April 2010) on various solvent extracts of *Chromolaena odorata* leaves was carried out for the anthelmintic operation. The anthelmintic action was experimented with within an adult Indian earthworm, "*Pheretima Posthuma*" as it has physiological and anatomical similarity within intestinal *roundworm* parasites of human beings. The investigation about this activity revealed that methanol extract endowed anthelmintic action in comparison to other extracts such as the petroleum ether and ethyl acetate. The extract capacity was determined to be inversely proportional to the time taken for worm paralysis/death [11].

Anticancer activity

The study, Adeolu A Adedapo *et.al*, (2016) measured the proliferation of *chromolaena odorata* methanolic leaf extract on human colorectal adenocarcinoma cell lines HT-29 (ATCC @ HTB- 38TM) using the Cell Titer 96 MTT Proliferation Assay where the viable cells were seeded at a density of 5/10⁴ (100/L / well). Various extract log concentrations (100-700 ubiquitous / mL) were applied and incubated for 24, 48, and 72 hours. Development of the extract was conjointly performed at numerous times within the presence of VEGF and ET-1. The MTT assay found that after 72 h the extract produced pronounced inhibitory effects on the lower concentration cancer cell lines having a greater effect. When the extract was developed along with neoplastic cell lines, the outcome showed that the last-mentioned concentrations were more effective in cell inhibition, but were more potent at 24 h once incubated with VEGF and ET-1. The result revealed that *Chromolaena odorata* methanol leaf extract alone induced pronounced prevention of HT29 cell lines after 72 h, but in the existence of mitogens, the impact on the cell line was that of proliferation, suggesting that the mitogens intervene with the ability of the plant extract to trigger cell line inhibition [12].

Conclusion

Nowadays the pharmacological activities of plant *Chromolaena odorata* have been shown by a different study. The phytoconstituents also play a significant role in plant behaviors such as flavonoids, phenolic acid, and other phytoconstituents as well. The data collected in this analysis contains a wide range of therapeutically promising *Chromolaena odorata* and has drawn more towards its multiple functioning. The current pharmacology work has now confirmed many of the typical applications of *Chromolaena odorata*. Innovation for many healthcare items will certainly be the subject of future research. A systematic and comprehensive review of *Chromolaena odorata* for the health clearance of medicinal applications should therefore be carried out in the future.

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Conflict of Interest

The authors have declared no conflict of interest.

Author Contribution

All authors Contributed equally

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