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Literature riview: Ethnoparmacognosy, chemical content, and pharmacological activity of Kirinyuh (chromolaena odorata L.) leaves

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ABSTRACT

Chromolaena odorata L. is a foliaceous plant that has its origins in the Americas and has since proliferated across Indonesia, Africa, and the Pacific region. Chromolaena odorata leaf is a botanical specimen that possesses alkaloids, flavonoids, tannins, saponins, and steroids, which are known for their therapeutic properties. The approach used in this article review involves conducting online literature studies. The research data consists of publications obtained from respected journal sites such as Google Scholar, PubMed, Science Direct, and Research Gate.The articles were chosen from publications that covered the time frame from 2013 and 2023. The purpose of this article is to present detailed information regarding the ethno-pharmacognosy, chemical composition, and pharmacological activity of Kirinyuh leaves (Chromomolaena odorata L.).

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1. Introduction

The Indonesian population has a longstanding tradition of utilizing medicinal plants as a means of addressing health issues. Knowledge pertaining to the use of medicinal plants has been transmitted from one generation to the next through experiential learning and acquired expertise. Society has widely recognized the utilization of conventional medicine for preserving public health over a considerable period. Currently, traditional medicine is the primary source of healthcare for 80% of the global population. Plants provide the source for approximately 25% of the contemporary pharmaceuticals distributed globally

While traditional medicine has a long history of use, it is not entirely devoid of risks, as it introduces foreign substances into the body. Therefore, it is crucial to be aware of the potential toxicity associated with traditional medicine. Toxic effects on live organisms may or may not be apparent when the absorbed dose is relatively low. Individual cells typically experience damage in such cases (Eriadi & Arifin, 2016).

A compound containing traditional medicine's relatively low side effects functions through a synergistic interaction of its diverse components. Due to the profusion of plants exhibiting multiple pharmacological effects, this substance is viable for the treatment of a wide range of metabolic and generative disorders. Other traditional remedies have the benefits of being readily available, inexpensive, simple to cultivate nearby, and suitable for universal consumption.

For millennia, people have used Kirinyuh leaves to treat a wide range of illnesses, including hypertension, wound healing, cough medication, and antimicrobials. Kirinyuh leaves are traditionally used by boiling them first and then drinking the heated water like tea.

Kirinyuh (*Chromolaena odorata* L.) is employed as a natural alternative to synthetic medications. The leaves of this plant have several health advantages, including flavonoids, tannins, triterpenes, saponins, and polyphenols. The fact that cherry leaves contain a number of active chemicals that can be used as natural medicine is still not widely known. Researchers have conducted extensive in vitro and in vivo studies on natural components, particularly kirinyuh leaves (*Chromolaena odorata* L.), in recent years.

This rationale serves as the foundation for this article review. Thus, the goal of this article review is to present data regarding the pharmacological activity, chemical composition, and ethno-pharmacognosy of Kirinyuh leaves (*Chromolaena odorata* L.) in relation to their ability to treat a range of illnesses. Multiple studies have demonstrated the advantageous properties of C. odorata L. leaf extract, such as its metabolite composition and pharmacological effects. The plant harbours a diverse array of advantageous secondary metabolites, including alkaloids, flavonoids, tannins, saponins, and steroids. Furthermore, leaf extracts have demonstrated a diverse range of pharmacological effects, including anti-inflammatory, antibacterial, antioxidant, analgesic, and wound-healing characteristics. Additional investigation is required to examine the antibacterial efficacy of cherry leaf essential oils against different bacterial strains and antibiotic-resistant bacteria.

2. Research Methods

Data analysis is conducted meticulously and methodically, utilising a range of pertinent literature sources related to the research issue. It is crucial to accomplish this in order for researchers to acquire comprehensive and precise data for the purpose of creating a high-quality literature review. To produce a critical analysis of this piece of work, we performed an online literature review. The research data comprises articles obtained from reputable journal platforms, such as Research Gate, Google Scholar, and PubMed. The publications covered by these articles extend over the time span of 2013 to 2023.

3. Analysis and Results

Kirinyuh, scientifically known as *Chromolaena odorata* L, is an indigenous weed originating from Central and South America. This plant exhibits a high level of invasiveness due to its prolific seed production capabilities. This plant can disperse through wind, adhering to animal fur, socks, or human garments, and even through vegetative means. Kirinyuh thrives in well-lit environments, particularly in open regions, meadows, plantation borders, and woodlands (Komala et al., 2021).

Kirinyuh possesses two different characteristics. Kirinyuh's first characteristic is its role as a noxious weed that poses a significant threat to nearby cultivated plants. This is because it competes with them for water and nutrients, leading to a substantial decrease in crop production, particularly in plantation crops like rubber, oil palm, and cashew. The second property exhibits prospective applications as organic fertilizers, pharmaceuticals, and extracts for use as bioherbicides (Komala et al., 2021).

Tabel 1
Etnopharmacognosy kirinyuh plant (*chromolaena odorata l.)*

Part	Country	Results	Reference
Leaf	Nigeria	This research suggests that *Chromolaena odorata* is used as an alternative to treat malaria.	(Elebiyo et al., 2023)
Leaf	Nigeria	*Chromolaena* odorata has potential for wound healing which has also justified the use of C. odorata as an ethno treatment and folklore as a wound healing agent in Nigeria and Africa.	(Ukwueze et al., 2013)
Leaf	India	Traditionally *(Chromolaena odorata)* has many medicinal properties especially for external treatment such as in wounds, skin infections, inflammation.	(Vaisakh, M N Pandey, 2012)
Leaf	Nigeria	In traditional medicine practice, kirinyuh leaves *(Chromolaena odorata)* are used for the treatment of skin infections, wounds and inflammation. This plant is used in various parts of its invasive range	(Omokhua-Uyi et al., 2020)

Part	Country	Results	Reference
		for the treatment of malaria, abdominal pain, and urinary tract infections.	
Leaves and roots	Nigeria	In Nigeria *(Chromolaena odorata)* is used for the treatment of dysentery, skin diseases, fever, urinary tract infections.	(Bamisaye et al., 2014)
Leaf	India	*Chromolaena odorata* in India is used in the treatment of infectious skin, burns.	(Rupesh, 2021)
Leaf	Nigeria	*Chromolaena odorata* A perennial shrub that has been used in the treatment of many diseases and disease conditions such as diabetes, malaria, wounds, inflammation, and fever.	(Olawale et al., 2022)
Leaf	Nigeria	The plant is traditionally used to disinfect wounds, prevent blood loss in wounds, and treat open wounds. Used by traditional medicine practitioners for treatment for the treatment of burns, wound healing, skin infections, and postpartum wounds.	(Omeke et al., 2019)
Leaf	India	In India, kirinyuh leaves are used in the treatment of diabetes mellitus.	(Bhargava et al., 2013)
Leaf	Nigeria	In folk medicine C. odorata leaf extract is used in the treatment of dysentery, diarrhea, and measles.	(M. A. et al., 2020)
Leaf	India	C. odorata plants are alien plant species in India. But the weed plant has benefits, namely for wound healing.	(Layek et al., 2022)
Leaf	Nigeria	*Chromolaena odorata* is used as a medicinal source in traditional medicine practices. The plant is known for its medicinal properties especially in the treatment of wounds.	(Omokhua et al., 2016)
Leaf	Nigeria	*Chromolaena odorata* is used in traditional medicine in Nigeria to treat malaria, cervical pain as well as a local antiseptic agent for wounds.	(Usunomena & Efosa, 2016)

The data shown in the table indicates that kirinyuh leaves (*Chromolaena odorata* L.) play a key role in traditional medicine in Nigeria and India. In Nigeria, kirinyuh leaves are utilized for the therapy of diverse ailments, including malaria, wounds, inflammation, diarrhea, fever, skin disorders, abdominal pain, urinary tract infections, and other conditions. Kirinyuh leaves in India are commonly used to treat diabetes, burns, skin infections, inflammation, and for wound care. These studies showcase the promise of kirinyuh leaves as a viable substitute for malaria treatment while also acknowledging their traditional function in promoting wound healing. This study validates the significance of this plant in traditional medicinal practices in both nations, emphasizing the potential for more investigation into its pharmacological characteristics that may serve as the foundation for the creation of novel medications.

Tabel 2
Chemical content kirinyuh plant (*chromolaena odorata l.)*

Part	Results	Reference
Leaf	In general, the results showed GC-MS analysis identified 20 compounds. They are hexadecanoic acid, methyl ester, n-hexadecanoic acid, 9,12,15-octadecatrienoic acid, methyl ester, phytol, 9,12,15 octadekatrienoic, methyl eicosaniate, 10,-12- hexadecadien, 11,13-dimethyl-12-tetradecen-1-acetate,7-heptadisiloksi, l-histidine amide, fatty acids, farsenyl acetate, silane, dimethyl (3-methylphenoxy).	(Dilla,et.al 2023)
Root	The results of characterization and identification using GC-MS obtained 29 compounds. They are pinen, kampene, n-dekane, trans-decaline, n-undekane, cis-thujone, trans-thujone, e-tagetone, tetrahydrolavandulol, n-dodecane, n-tridekane, α-longipinene, n-tetradekane, β-caryopilene, β-farnesene, y-muurolene, β-selinene, α-bulnesene, guaiol, 10-epi-y-eudesmol, α-acorenol, himachalol, androencecalinol, cedr-8-en-14-ol, 2-methoxy-6-(1-methoxy-2-propenyl) naptalene, 7-isopropyl-1,4-dimetl-2-azulenol. The compound content that has the highest percentage is phenyl-derived essential oil, which is 41.6%.	(Joshi, 2013)
Leaf	Essential oils from dried leaves of chromolaena odorata are obtained by hydrodistillation and analyzed using mass spectroscopic gas chromatography which has many components.	(Owolabi et al., 2010)
Leaf	The most dominant compounds found in young leaves and old leaves are flavonoid compounds.	(Sulistyarini, dkk. 2022)
Leaf	C. odorata plants contain flavonoids, tannins, alkaloids, terpenoids, saponins, steroids, and cardiac glycosides.	(M. A. et al., 2020)

Part	Results	Reference
Leaf	The results of the identification of kirinyuh leaf extract using methanol and ethanol solvents showed different types, amounts, and compositions of compounds. In addition, kirinyuh leaves contain various kinds of essential oils including α-pinene 42.2%, β-pinene 10.6% and germacrene D 9.7%.	(Mayesti, et.al. 2023)
Leaf	The results of the largest percent of flavonoid levels from the Surabaya area are supported by screening results with the addition of Wilstater reagent has a more intense yellow color than from Bogor and Malang. At the value of ash content, the acid insoluble ash content is higher than the city of Malang.	(Ance et al., 2018)

Based on multiple research findings, Kirinyuh (*Chromolaena odorata* L.) exhibits promising potential as a source of pharmaceutical compounds. The intricate composition of chemical substances found in the leaves and roots, including flavonoids, tannins, alkaloids, terpenoids, saponins, steroids, and cardiac glycosides, demonstrates the diverse range of pharmacological possibilities that can be investigated.

Several studies indicate that this plant exhibits efficacy in treating a wide range of health issues, including malaria, wounds, inflammation, diabetes, and skin infections, among others. By analyzing leaves and roots with gas chromatography-mass spectrometry (GC-MS), many different chemicals have been found. These chemicals have a wide range of beneficial pharmacological effects. Young leaves with high levels of flavonoids have demonstrated potential for treating wounds and skin infections. Similarly, essential oil components like α-pinene, β-pinene, and germacrene D have shown promise as antibacterial agents. However, additional investigation is required to comprehend the mechanism by which these chemicals function and their precise effectiveness in treating specific disorders.

Additional advancements, including preclinical and clinical investigations, are necessary to validate its efficacy in humans and ascertain the optimal dosage and potential adverse reactions that may occur. By learning more about kirinyuh's chemical make-up and pharmacological activity, it shows promise as a source of active ingredients for the creation of new drugs or as an addition to traditional medicines that can make them work better at treating certain illnesses. This underscores the need for more advancement to investigate the potential of this plant as a reservoir of therapeutic advantages for human well-being.

Tabel 3
Pharmacological activity kirinyuh plant (*chromolaena odorata l.)*

Part	Activity	Results	Reference
Daun	Antioxidant	Testing the antioxidant activity of ethanol extract was able to capture free radicals with the DPPH method by showing absorption bands at 517 nm.	(Bhargava et al., 2013)
Daun	Using test animals Albino rats	*Chromolaena odorata* has potential for wound healing which may be due to the presence of phytoconstituents such as flavonoids, tannins, phenolic compounds, and terpenoids.	(Ukwueze et al., 2013)
Leaf	Antibacterial	Showing that C. odorata leaf extract can be used in wound treatment because it inhibits in vitro growth of *p. aeruginosa* isolated from infected wounds, it helps reduce the appearance of antibiotic-resistant strains.	(Omeke et al., 2019)
Leaf	Antimicrobials and antibacteria	Its essential oil components have antimicrobial and antibacterial activity against *Bacilus cereus* and have antifungal activity of *Aspergilus niger*.	(Owolabi et al., 2010)
Leaf	Antioxidant DPPH and ABTS methods	The highest yield yield of kirinyuh leaves with the highest yield is with methanol solvent with a yield of 10.00%. For testing antioxidant activity and phenolic content, ethyl acetate extract showed the highest antioxidant activity against either DPPH or ABTS.	(Putri & Fatmawati, 2019)
Leaf	Antioxidant	The height of the growing location affects the antioxidant power of kirinyuh leaves which is significantly influenced by the total flavonoid levels of kirinyuh leaves.	(Rubani, Akhmad. 2022)

Part	Activity	Results	Reference
Leaf	Antibacterial Bakteri : *S. aureus* Dan *E. Coli*	Antimicrobial test of kirinyuh leaf methanol extract showed that kirinyuh leaf extract has antimicrobial activity of *E. Coli* and *S. Aureus*.	(Munte et al., 2017)
Leaf	Antimalaria With experimental animals' rats	*Chromolaena odorata* has antimalarial activity comparable to the standard drug chloroquine and lumenfrantin artermeter which shows the fraction contains bioactive molecules with strong antimalarial properties.	(Elebiyo et al., 2023)
Leaf	Antibacterial: Bacteri propionibacterium acnes	Ethanol extract contains flavonoid compounds, tannins, saponins. The best activity is ethyl acetate fraction and ethanol extract at a concentration of 20% with an LDH value of 4,375 mm.	(Komala et al., 2021)
Leaf	Toxicity test on mice	The results of acute toxicity testing of kirinyuh leaf ethanol extract using the reed and muench methods were 14.1416% g / KgBB or 28.82% extract and included in the mild toxic category.	(Jumain, dkk. 2018)
Leaf	Test antibacterial activity with	Kirinyuh leaf metabolite compounds have antibacterial activity are alkaloids, phenolics and flavonoids. Also has antibacterial activity	(Azharini et al., 2022)
Leaf	Antioxidant DPPH Method	The results on antioxidant activity testing show C. odorata is an electron donor capable of neutralizing free radicals. The total phenolic compounds, flavonoids, and other secondary plant metabolites contained in the extract are thought to act as proton absorbers and synergistically produce potential antioxidant activity and free radical antidote.	(Alisi, 2011)
Leaf	Antibacterial with bacterial gangrene	Leaf kirinyuh ethanol extract has antibacterial activity in the form of an inhibitory zone against gangrenous wound bacteria. With the best concentration of leaf kirinyuh ethanol extract is 30%	(Yutika, 2015)
Leaf	Antibacterial with bacteria *Staphylococcus aureus*	Hasil yang didapat pada penelitian ini dibuat ekstrak metanol dan di uji secara kualitatif menggunakan skrining fitokimia terbukti mengandung flavonoid.	(Tuslinah, 2022)
Leaf	Antifungal	70% leafkirinyuh ethanol extract has almost the same effect as ketoconazole as an antifungal because the extract does not have a significant difference with ketoconazole and is able to inhibit the growth of *Malassezia furfur fungus*.	(Gelyaman,E. 2016)

The data provided demonstrate the significant potential of *Chromolaena odorata* (kirinyuh) in multiple health-related domains. Studies have identified antioxidant, antibacterial, antifungal, and antimalarial properties. The evaluation of antioxidant activity using DPPH and ABTS methods demonstrated that the ethyl acetate extract derived from kirinyuh leaves exhibited the highest antioxidant activity. This indicates its capacity to effectively scavenge potential free radicals and provide cellular protection.

Experimental studies conducted on albino rats have demonstrated the ability of kirinyuh to promote wound healing. Researchers believe that the presence of phytoconstituents such as flavonoids, tannins, phenolic compounds, and terpenoids is responsible for this effect. Furthermore, studies have shown that the substance possesses antibacterial properties against a range of bacterial pathogens, including Escherichia coli, Staphylococcus aureus, and Pseudomonas aeruginosa. These findings suggest its potential use in treating common bacterial illnesses.

Studies on antimalarial activity demonstrate the efficacy of kirinyuh in combating this condition, with comparable results to conventional medications. Furthermore, there is evidence of antifungal action, suggesting possible use in the treatment of fungal infections.

However, toxicity experiments on mice classified the ethanol extract of kirinyuh leaves as mildly hazardous, highlighting the need for further investigation into appropriate dosages and potential adverse reactions before extensive application in human medicine. Hence, further investigation into

appropriate dosages and potential adverse reactions must be conducted prior to their extensive application in human medicine.

Kirinyuh holds promise as a valuable reservoir of drugs containing potent compounds that exhibit diverse pharmacological effects. Researchers can harness these compounds to create novel medications that combat bacterial infections, provide antioxidant properties, and address the potential for treating malaria. However, researchers must conduct further investigation to ensure the safety and effectiveness of applying these compounds in human healthcare, including studying adverse reactions, optimal dosage, pharmaceutical preparations, and conducting human trials.

4. Conclusion

The data provided in the table on ethno-pharmacognosy, chemical composition, and pharmacological effects of kirinyuh leaves (*Chromolaena odorata* L.) suggests that this plant holds promise as a viable candidate for drug discovery. The presence of many active components, including flavonoids, tannins, terpenoids, alkaloids, saponins, and phenolic compounds, in the leaves of this plant indicates significant pharmacological promise. Research has documented several actions, including effective antioxidants, antibacterial capabilities against pathogens, wound healing ability, as well as antimalarial and antifungal qualities. Furthermore, the findings indicated that the spatial distribution of plant development significantly influenced the concentrations of bioactive chemicals and the antioxidant capacity of the plants.

However, more research is needed to find out exactly how the active ingredient works, to find out what dosage levels are safe, and to confirm that using kirinyuh as a medicine is both effective and safe. It is essential to consider the formulation of suitable drugs to fully harness the therapeutic capabilities of this plant. In general, kirinyuh exhibits promising prospects as a dependable medicinal resource for treating specific ailments. However, further investigation is necessary to guarantee its safety, effectiveness, and appropriate application in the realm of human medicine. A comprehensive examination of Kirinyuh leaves through a literature review has the capacity to greatly enhance scientific understanding, facilitate drug development, and promote sustainable management of resources, while having extensive implications for public health and overall welfare. It is crucial to acknowledge that these are possible contributions and consequences, and the true effect of the review will depend on its excellence, distribution, and adoption by researchers, policymakers, and communities.

Additional investigation is required to separate and ascertain the precise chemicals accountable for the pharmacological effects. Further research should prioritise the implementation of mechanical investigations to elucidate the precise processes and mechanisms by which leaf extracts exert their pharmacological effects. Researchers conduct clinical investigations to assess the safety and efficacy of C. odorata L. leaf extract in humans. Additionally, standardisation and quality control measures are implemented to maintain uniformity in the phytochemical content and pharmacological effects of the leaf extracts.

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