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Systematic Literature Review : Potential Of Kirinyuh Leaves (*Chromolaena Odorata*) As A Wound Treatment

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ABSTRACT

A wound is damage to body tissue that can occur due to cuts, impacts, heat, infection, or chemicals. Wounds that are not properly treated can cause infection, inflammation, bleeding, and disruption of new tissue formation. One plant that has been widely studied is the kirinyuh leaf (Chromolaena odorata). This study used the Systematic Literature Review (SLR) method. Articles were searched through Google Scholar, PubMed, ScienceDirect, Semantic Scholar, Garuda, and Crossref for the period 2017-2025. The article selection process used the PRISMA flow through the stages of identification, screening, eligibility, and inclusion. The initial search results obtained 186 articles. After removing duplicate articles, screening titles and abstracts, and full-text examination, 41 final articles were obtained that met the analysis requirements. The articles analyzed consisted of laboratory experimental studies, in vivo, in vitro, literature reviews, systematic reviews, phytochemical analysis, and GC-MS or UPLC-MS analysis. The results showed that flavonoids were the compounds most frequently found in kirinyuh leaves and were most associated with accelerated wound healing. Kirinyuh leaves have been shown to accelerate wound closure, increase collagen formation, increase angiogenesis, repair fibroblasts, and inhibit the growth of bacteria such as Staphylococcus aureus, Escherichia coli, Salmonella typhi, MRSA, and ESBL. Burn wound research shows that N-hexane extract of kirinyuh leaves at a concentration of 30% provides a healing rate of 79% on the 21st day. Another study showed that a serum combination of kirinyuh essential oil and curcumin provides healing of diabetic wounds by 68.068%. The most commonly used dosage forms are gels, ointments, creams, serums, sprays, essential oils, and topical extracts.

Keywords:
Kirinyuh Leaves, *Chromolaena Odorata*, Wound Healing, Antibacterial, Anti-Inflammatory

INTRODUCTION

A wound is damage to body tissue that can occur due to impact, cuts, heat, infection, chemicals, or certain diseases. Wounds that are not treated promptly can cause pain, bleeding, swelling, infection, and even more severe tissue damage. The wound healing process goes through several stages: hemostasis, inflammation, proliferation, and remodeling. During these stages, the body requires collagen formation, new blood vessel growth, bacterial control, and inflammation reduction to ensure wound closure and tissue recovery. Disruption of any of these stages can delay wound healing and even lead to chronic wounds (Putry, Harfiani, & Tjang, 2021). Other research explains that increased angiogenesis and fibroblast activity are essential for the formation of new tissue in wounds because new

blood vessels carry oxygen and nutrients to the damaged area (Rosanto & Ardhiyanti, 2021). Current wound treatment does not only rely on synthetic drugs, but many studies are beginning to develop natural ingredients as alternative therapies. Herbal medicines are chosen because they are readily available, less expensive, and contain secondary metabolites that can facilitate the wound healing process. One plant that is beginning to receive widespread research is the kirinyuh leaf (*Chromolaena odorata*). This plant has long been used by people as a traditional medicine for external wounds, burns, skin infections, and minor bleeding. Various studies have shown that kirinyuh leaves have anti-inflammatory, antibacterial, antioxidant, antiseptic, analgesic, and hemostatic activities that are essential in the wound healing process (Harfiani *et al* ., 2022). Another literature review states that the traditional use of kirinyuh leaves in wound treatment has been empirically proven in many communities and is supported by the results of modern pharmacological research (Wulandari, Wirasutisna, Mariani, & Wibowo, 2024).

Kirinyuh leaves are known to contain many active secondary metabolites that facilitate wound tissue repair. Phytochemical research shows that kirinyuh leaves contain flavonoids, alkaloids, tannins, saponins, steroids, phenols, terpenoids, and essential oils (Tedjasulaksana, Nahak, & Ratmini, 2022). Flavonoid compounds work as antioxidants and anti-inflammatories, helping to suppress free radicals and inflammatory mediators in wounds (Fratiwi, Saranani, Agastia, & Isrul, 2022). Tannins have astringent and hemostatic effects, helping to stop bleeding and protect the wound surface from microbial infection (Ningsih *et al* ., 2024). Saponins facilitate collagen formation and accelerate new tissue formation during the wound proliferation phase (Wulandari, Handajani, & Rosanto, 2020). The phenol and terpenoid content in kirinyuh leaves is also known to have antibacterial activity against bacteria that cause wound infections such as *Staphylococcus aureus* and *Escherichia coli* (Juwairiah & Roebiakto, 2022). Various experimental studies have shown that kirinyuh leaves have a significant ability to accelerate wound healing. Research on mouse cuts showed that the ethyl acetate fraction of kirinyuh leaf ethanol extract can increase wound healing by more than 70% and improve collagen formation and wound tissue epithelium (Efendi, Elisma, & Zahira, 2023). Other research shows that a 10% concentration of kirinyuh leaf extract can increase collagen fiber density in wounds after tooth extraction and accelerate angiogenesis compared to the control group (Wulandari, Handajani, & Rosanto, 2020). In burns, a 30% concentration of N-hexane extract of kirinyuh leaves can provide a healing rate of up to 79% on day 21 (Muhaira *et al* ., 2024). Research on wound medicine spray from kirinyuh ethanol extract even showed total healing of external wounds in about 120 hours (Emil & Emil, 2025).

In addition to accelerating wound healing, kirinyuh leaves also have antibacterial properties that facilitate preventing infection in the wound area. Well diffusion studies show that kirinyuh leaf essential oil can inhibit the growth of *Staphylococcus aureus* and *Escherichia coli* with the largest inhibition zone at a concentration of 30 µL (Juwairiah & Roebiakto, 2022). Other studies show that ethanol extract of kirinyuh leaves can inhibit *Salmonella typhi* , *Staphylococcus aureus* , and *multi-drug resistant* organisms (MDRO) bacteria (Fadia, Nurlailah, Herlina, & Lutpiatina, 2020). This antibacterial activity greatly facilitates the wound healing process because bacterial infections often cause wounds to be difficult to heal and trigger prolonged inflammation (Gultom *et al* ., 2021). Kirinyuh leaves have also been developed into various topical dosage forms such as gels, ointments, serums, sprays, essential oils, and creams. Evaluation research on kirinyuh leaf extract cream preparations showed that all formulas met the physical requirements for topical preparations, such as homogeneity, pH, stability, and spreadability, making them suitable for use as wound medicine (Fadila, Syaifiyatul H., & Hasanah, 2022). Other research showed that the combination of kirinyuh leaf essential oil and curcumin in gel and serum forms effectively accelerated the healing of diabetic wounds in Wistar rats (Zain, Idacahyati, & Novitasari, 2022). This topical dosage form offers significant opportunities for the development of kirinyuh leaves into modern pharmaceutical products that are more practical and safe for public use (Putri, Idacahyati, & Zain, 2022). Although research on kirinyuh leaves has been quite extensive, the results are still scattered across various studies, including antibacterial, anti-inflammatory, and phytochemical tests, formulation tests, and wound healing tests on experimental animals. This situation means that scientific information regarding the potential of kirinyuh leaves as a wound treatment is still not neatly organized in a single, integrated discussion. Therefore, research using *the Systematic Literature Review* (SLR) method is needed to collect, examine, compare, and compile the results of previous research in order to obtain a clearer scientific picture regarding the effectiveness of kirinyuh leaves as a wound healing therapy.

Based on the above background, this study discusses the potential of kirinyuh leaves (*Chromolaena odorata*) as a wound medicine based on the results of existing scientific research. This study also looks at the active compounds in kirinyuh leaves and helps facilitate the wound healing process. Not only that, this study discusses the pharmacological activities of kirinyuh leaves, such as antibacterial activity to fight bacteria, anti-inflammatory to reduce inflammation, antioxidants to protect body cells, angiogenesis to facilitate the formation of new blood vessels, and collagen formation that facilitates wound closure. This study also reviews the effectiveness of various forms of kirinyuh leaf preparations, such as extracts, ointments, gels, or other forms in wound treatment based on previous research. This study aims to determine the potential of kirinyuh leaves (*Chromolaena odorata*) as a wound treatment based on the results of previous research. This study also aims to determine the content of secondary metabolites in kirinyuh leaves related to the wound healing process. Furthermore, this study aims to determine the pharmacological activity of kirinyuh leaves in facilitating the wound healing process. This study also wants to determine the effectiveness of various forms

of kirinyuh leaf preparations in wound treatment therapy. All previous research results were then compiled and analyzed systematically using the *Systematic Literature Review* (SLR) method.

LITERATURE REVIEW

Kirinyuh leaves (*Chromolaena odorata*)

Kirinyuh leaves have the scientific name *Chromolaena odorata* and belong to the Asteraceae family. This plant is also known by other names such as kopasanda, Siam weed, kirinyu, and komba-komba. Kirinyuh was originally known as a wild weed, but is now widely studied because it contains secondary metabolites that are beneficial for health, especially in wound healing (Harfiani *et al* ., 2022). Ethnopharmacognosy studies explain that people in various regions have long used kirinyuh leaves to treat external wounds, burns, skin infections, pain, and minor bleeding traditionally (Wulandari, Wirasutisna, Mariani, & Wibowo, 2024). The kirinyuh plant grows as a shrub with a height of about 1-3 meters. The leaves are oval to triangular, green, have pointed tips, and the leaf surface is slightly hairy. The stem is branched and the kirinyuh flowers are purplish white. Kirinyuh leaves have a distinctive, strong odor because they contain essential oils and various volatile compounds. Research on secondary metabolites using the GC-MS method found the presence of compounds such as Germacrene D and Calarene in kirinyuh leaf extract, which contribute to the distinctive aroma and biological activity of this plant (Makin, Tnunay, & Wiguna, 2023).

Kirinyuh can grow in tropical areas with adequate sunlight exposure and is commonly found on roadsides, gardens, wild bushes, vacant lots and mountainous areas. Environmental factors influence the secondary metabolite content. Research in the Ie Seum geothermal area of Aceh Besar showed that kirinyuh leaves grown in geothermal areas had a greater variety of volatile components and stronger antibacterial activity than those from conventional areas (Munira, Rasidah, Zakiah, & Nasir, 2022). Another study in Bali Province showed that flavonoid and alkaloid levels in kirinyuh leaves varied by region owing to geographic conditions and the plant's growing environment (Tedjasulaksana, Nahak, & Ratmini, 2022). Kirinyuh leaves contain many active compounds, such as flavonoids, alkaloids, saponins, tannins, steroids, phenols, triterpenoids, and essential oils, which have broad pharmacological activity (Harfiani *et al* ., 2022). Metabolite profiling studies using UPLC-MS have found that most compounds in the ethanol extract of kirinyuh leaves belong to the flavonoid group, particularly pyranoflavones, which have high anti-inflammatory and antioxidant activities (Ratmini & Tedjasulaksana, 2024). Other quantitative studies have shown higher alkaloid levels from maceration extraction than from ultrasonic methods, thus significantly influencing the amount of active compounds obtained (Nayaken, Hakim, & Alawiyah, 2023).

In addition to its use as a traditional medicinal plant, kirinyuh leaves have been developed into various pharmaceutical preparations, including gels, creams, ointments, serums, essential oils, and antiseptic sprays. Research on kirinyuh leaf extract cream formulations showed that all formulas met the requirements for homogeneity, stability, pH, and spreadability, making them suitable for use as topical wound remedies (Fadila, Syaifiyatul H., & Hasanah, 2022). Other studies have shown that the combination of kirinyuh leaf essential oil and curcumin in gel and serum forms can accelerate the healing of diabetic wounds in test animals (Zain, Idacahyati, & Novitasari, 2022). This indicates that kirinyuh leaves have great potential for development as modern herbal products in the pharmaceutical and health sectors.

Wounds and Wound Healing

A wound is damage to body tissue caused by an impact, cut, heat, chemical, bite, or infection. This damage can occur in the skin, soft tissues, blood vessels, and other organs of the body. Wounds that are not properly treated can cause pain, bleeding, swelling, infection, and severe tissue damage. Bacterial infections, such as those caused by Staphylococcus aureus, Escherichia coli, and Pseudomonas aeruginosa, often lead to wounds that are difficult to heal because bacteria can prolong the inflammatory process and damage new tissues (Damayanti & Maryati, 2025). Wounds can be classified into several types, including cuts, burns, stab wounds, abrasions, diabetic wounds, and infections. Burns occur due to heat or chemicals that damage skin tissue, whereas diabetic wounds appear due to metabolic and blood circulation disorders in patients with diabetes mellitus. Research on second-degree burns has shown that N-hexane extract from kirinyuh leaves can accelerate wound healing by up to 79% by the 21st day (Muhaira *et al* ., 2024). Another study showed that a combination of kirinyuh essential oil and curcumin was effective in accelerating the healing of diabetic wounds in Wistar rats (Putri, Idacahyati, & Zain, 2022).

Wound healing occurs through several stages: hemostasis, inflammation, proliferation, and remodeling. The hemostasis stage occurs when the body stops bleeding through the formation of a blood clot. This is followed by the inflammation stage, characterized by swelling and immune cell activity to clear the wound area of bacteria and damaged tissue. The proliferation stage is characterized by the formation of collagen, fibroblasts, and new blood vessels, or angiogenesis. The final stage is remodeling, the process of new tissue maturation until the wound completely closes (Putry, Harfiani, & Tjang, 2021). Fibroblast formation and angiogenesis are significantly related to the speed of wound healing. Research on rabbit nasal mucosa wounds shows that ethanol extract of kirinyuh leaves can increase the number of fibroblasts, thus accelerating new tissue formation (Husni, Rahmawati, & Irnawati, 2022). Another study showed that a 10% concentration of kirinyuh leaf extract can increase the number of new blood vessels,

the highest in wounds after guinea pig tooth extraction (Rosanto & Ardhiyanti, 2021). Good collagen formation will make wounds close faster and the tissue become stronger (Wulandari, Handajani, & Rosanto, 2020).

Chemical Content of Kirinyuh Leaves

Kirinyuh leaves contain many active chemical compounds that support the wound healing process. One of the most abundant compounds is flavonoids. Flavonoids act as antioxidants and anti-inflammatories by suppressing free radicals and inhibiting inflammatory mediators such as IL-6 in the early stages of wound healing (Fratiwi, Saranani, Agastia, & Isrul, 2022). Flavonoids also facilitate the formation of new blood vessels, improving the supply of oxygen and nutrients to wound tissue (Panjaitan, Telussa, Sihotang, & Sasputra, 2023). Saponins in kirinyuh leaves facilitate collagen formation and new tissue regeneration. Research on wounds after tooth extraction shows that saponins increase collagen fiber density, resulting in faster wound healing (Wulandari, Handajani, & Rosanto, 2020). Saponins also accelerate the proliferation phase and facilitate the formation of new epithelium in wound tissue (Efendi, Elisma, & Zahira, 2023). Tannins are another compound found abundantly in kirinyuh leaves. Tannin quantification research shows that kirinyuh leaf extract contains 3.018 mg GAE/gram of tannin (Ningsih *et al* ., 2024). Tannins have astringent and hemostatic properties that help stop bleeding, shrink tissue pores, and form a protective layer on wounds to prevent bacteria from entering. These compounds also facilitate faster wound healing and reduce the risk of infection (Ningsih *et al* ., 2024).

Alkaloids in kirinyuh leaves are known to have antioxidant activity that helps protect tissues from free radical damage. Research on alkaloid levels shows that the maceration extraction method produces higher alkaloid levels than ultrasonic extraction, at 8.259% (Nayaken, Hakim, & Alawiyah, 2023). Alkaloids facilitate increased antioxidant enzyme activity, thereby improving tissue regeneration. Phenols, steroids, triterpenoids, and essential oils in kirinyuh leaves exhibit antibacterial and antiseptic properties against various bacteria that cause wound infections. Antibacterial research has shown that the extract and essential oil of kirinyuh leaves can inhibit the growth of Staphylococcus aureus, Escherichia coli, Salmonella typhi, and even drug-resistant bacteria (MDRO) (Juwairiah & Roebiakto, 2022). Compounds such as Germacrene D, β-caryophyllene, and α-pinene from kirinyuh essential oil are known to have anti-inflammatory and antimicrobial activities that facilitate wound tissue protection (Fauzi, Idacahyati, & Gustaman, 2021).

Benefits of Kirinyuh Leaves

Kirinyuh leaves exhibit numerous pharmacological activities that support wound healing. The anti-inflammatory activity of kirinyuh leaves has been demonstrated by reducing IL-6 levels in Wistar rats experiencing inflammation. This reduction in pro-inflammatory cytokines facilitates a reduction in swelling and accelerates the initial phase of wound healing (Fratiwi, Saranani, Agastia, & Isrul, 2022). Another systematic study showed that kirinyuh leaf extract has anti-inflammatory effectiveness similar to that of dexamethasone in animal models (Vinata, 2025). The antibacterial properties of kirinyuh leaves are evident in the ability of the extract and essential oil to inhibit the growth of various pathogenic bacteria. Juwairiah and Roebiakto showed that kirinyuh leaf essential oil had the largest inhibition zone against E. coli and S. aureus at a concentration of 30 µL (Juwairiah & Roebiakto, 2022). Other studies have shown that hydrocarbon-based kirinyuh leaf extract ointment has better antibacterial activity than absorption-based ointments because the active substance is more easily released into the wound area (Munandar & Nugroho, 2017).

Kirinyuh leaves also accelerate collagen formation and angiogenesis. Research on guinea pigs showed that a 10% concentration of kirinyuh leaf extract increased collagen density and the number of new blood vessels the most compared to other groups (Wulandari, Handajani, & Rosanto, 2020). Research on mouse incisions showed that 40% kirinyuh extract increased angiogenesis better than 10% povidone iodine (Panjaitan, Telussa, Sihotang, & Sasputra, 2023). Research indicates that kirinyuh leaves are safe for use as herbal medicines. Acute toxicity tests on white mice showed no deaths in test animals up to a dose of 15 g/kgBW, and no significant damage was found in the liver or kidneys. This indicates that kirinyuh leaves have a sufficiently high safety level to be developed as a topical pharmaceutical preparation for wound treatment (Tedjasulaksana & Ratmini, 2023).

METHOD WRITING

Types of research

This study employed a *Systematic Literature Review* (SLR) method. This method was used to collect, select, evaluate, and combine various scientific research findings discussing the potential of kirinyuh leaves (*Chromolaena odorata*) as a wound treatment. An SLR was chosen because it allows for the systematic compilation of research findings, allowing data from multiple journals to be compared and analyzed in a comprehensive discussion. This study focused on the wound healing activities of kirinyuh leaves, including antibacterial, anti-inflammatory, antioxidant, angiogenic, and collagen formation activities, as well as the formulation of topical preparations made from kirinyuh leaves (Putry, Harfiani, & Tjang, 2021). This study employed a qualitative descriptive approach because the data used were derived from previous research in the form of national and international scientific articles. All articles were analyzed based on

the research objectives, research methods, preparation types, active compound content, pharmacological activity, research results, and research conclusions related to kirinyuh leaf wound healing (Harfiani *et al* ., 2022).

Article Search Strategy

An online article search was conducted in May 2026 using several scientific databases, namely, Google Scholar, PubMed, ScienceDirect, Semantic Scholar, Garuda, and Crossref. The search was conducted in stages by entering a combination of Indonesian and English keywords related to Kirinyuh leaves and wound healing. The articles found were then collected in PDF format and recorded in an article selection table to facilitate the data identification and filtering process (Wulandari, Wirasutisna, Mariani, & Wibowo, 2024). The search process was carried out using Boolean operators such as "AND," "OR," and "NOT" to ensure more targeted results. The articles obtained were from research journals, seminar proceedings, and literature reviews discussing the pharmacological activity of kirinyuh leaves on wounds, wound infections, burns, diabetic wounds, cuts, and new tissue formation. All articles found were then checked for the appropriateness of the title, abstract, research content, and completeness of research data before being selected for the final study (Putra & Mukhlishah, 2022). The selected articles ranged from 2017 to 2025, as numerous studies have explored the pharmacological activity of kirinyuh leaves in modern and traditional wound treatment during that period. The selected articles were from journals with full *text access* and clear research data, including methods, results, and conclusions (Vinata, 2025).

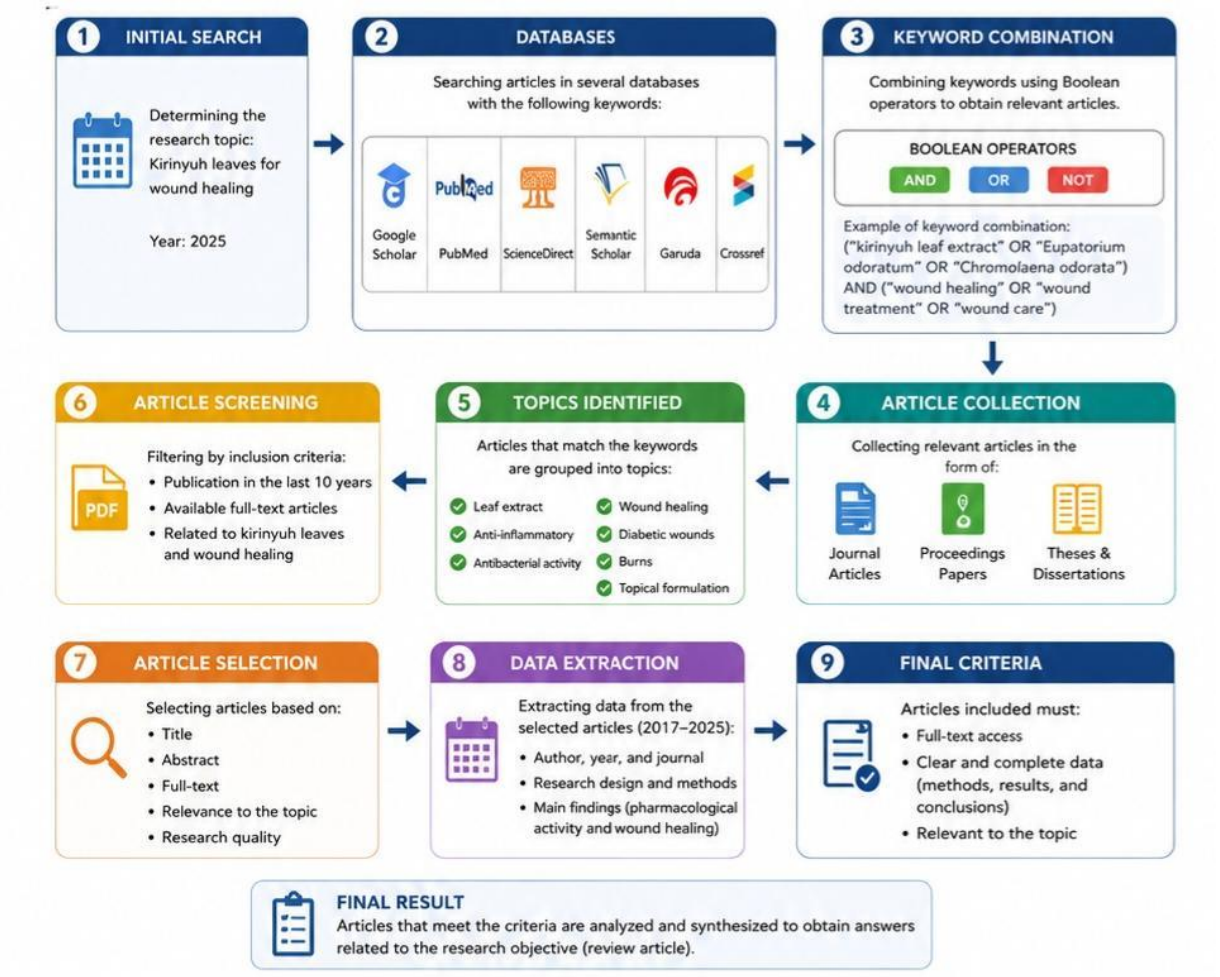

Figure 1Article Search Strategy

Source: Edraw Max, Processed by Researchers (2026)**Search Keywords**

Search keywords were arranged based on the research topic so that the articles found were a ligned with the study focus. Keywords used in Indonesian included "kirinyuh leaves,'' " *Chromolaena odorata* ", "wound treatment,'' "wound healing,'' "antibacterial activity,'' "anti-inflammatory,'' "burns,'' "diabetic wounds,'' "kirinyuh leaf ointment,'' "kirinyuh leaf gel,'' and "wound healing.'' The keywords in English included " *Chromolaena odorata* wound healing,'' "Kirinyuh leaf extract,'' "anti-inflammatory activity,'' "antibacterial activity,'' "burn wound,'' "diabetic wound healing,'' "topical formulation,'' "collagen formation,'' "angiogenesis,'' and "herbal wound

medicine,'' This combination of keywords was used to expand the search results for national and international scientific articles (Fratiwi, Saranani, Agastia, & Isrul, 2022).

Table 1Search Keywords

No	Language	Search Keywords
1	Indonesia	kirinyuh leaves
2	Indonesia	*Chromolaena odorata*
3	Indonesia	wound treatment
4	Indonesia	wound healing
5	Indonesia	antibacterial activity
6	Indonesia	anti-inflammatory
7	Indonesia	Burns
8	Indonesia	diabetic wounds
9	Indonesia	kirinyuh leaf ointment
10	Indonesia	kirinyuh leaf gel
11	Indonesia	wound healing
12	English	*Chromolaena odorata* wound healing
13	English	Kirinyuh leaf extract
14	English	anti-inflammatory activity
15	English	antibacterial activity
16	English	burn wound
17	English	diabetic wound healing
18	English	topical formulation
19	English	collagen formation
20	English	angiogenesis
21	English	herbal wound medicine

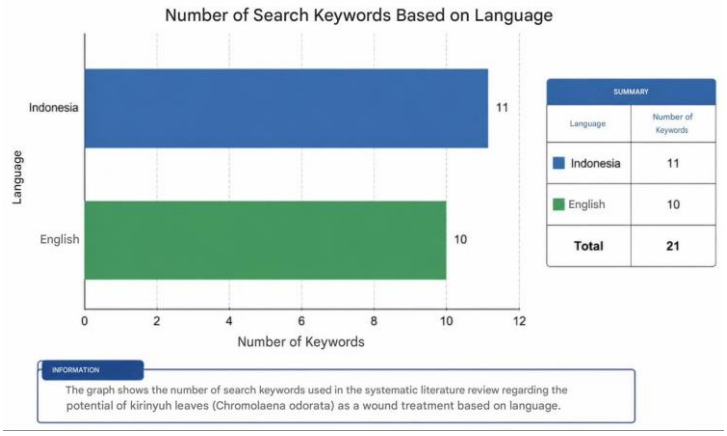

Figure 2Search Keyword Graph
Source: SigmaPlot, Processed by Researchers (2026)

The graph shows the number of search keywords used in *the systematic literature review* on the potential of kirinyuh leaves (*Chromolaena odorata*) as a wound treatment based on the language used. There were 11 Indonesian keywords and 10 English keywords. These results indicate that the article search was conducted using two languages to obtain more scientific articles that are more relevant to the research topic. The use of Indonesian keywords made it easier to find national articles, while English keywords made it easier to find international articles discussing the wound healing, antibacterial, anti-inflammatory, angiogenesis, collagen formation, and formulation activities of the leaves of this plant. The total number of keywords used in the article search process was 21.

Criteria

Table 2Inclusion and Exclusion Criteria

No	Criteria	Type	Explanation
1	Research topics	Inclusion	The article discusses kirinyuh leaves (*Chromolaena odorata*) as a wound treatment.
2	Focus of discussion	Inclusion	Articles discuss wound healing, antibacterial, anti-inflammatory, antioxidant activity, angiogenesis, collagen formation, or the formulation of wound medication preparations.
3	Types of journals	Inclusion	Articles come from national and international journals.
4	Year of publication	Inclusion	Articles published in 2017 - 2025.
5	Article availability	Inclusion	The article is available in full text form.
6	Research methods	Inclusion	Articles have clear research methods such as experimental research, *in vivo* , *in vitro* , or *literature review* .
7	Types of research	Inclusion	Research using test animals, laboratory tests, antibacterial tests, topical formulations, and secondary metabolite analysis are still acceptable as long as they are related to wound treatment.
8	Completeness of data	Inclusion	The article contains complete research objectives, research methods, research results, discussion, and research conclusions.
9	Content suitability	Inclusion	The content of the article is in accordance with the focus of *the systematic literature review* on the potential of kirinyuh leaves as a wound treatment.
10	Inappropriate topic	Exclusion	The article does not discuss wound healing or is not related to the pharmacological activity of kirinyuh leaves on wounds.
11	Incomplete data	Exclusion	The article does not have complete research data.
12	Duplicate articles	Exclusion	The same article was found more than once in the search database.
13	Full text not available	Exclusion	Articles without full access were not included in the study.
14	Article type does not match	Exclusion	Articles that are only opinions, news, or non-scientific writings are not used.
15	Focus on other diseases	Exclusion	Studies that only discussed antihypercholesterol, antidiabetes, or other diseases without a relationship to wounds were excluded from the selection.
16	Article language	Exclusion	Articles other than Indonesian and English were not included due to limitations in translating research data.

Inclusion Criteria

Articles selected for this study must meet several predetermined requirements. They must discuss kirinyuh leaves (*Chromolaena odorata*) and their relationship to wound healing, antibacterial, anti-inflammatory, antioxidant activity, angiogenesis, collagen formation, or wound medication formulations. Articles should be sourced from national and international journals published between 2017 and 2025 and available in *full text* (Putry, Harfiani, & Tjang, 2021). Selected articles must also have clear research methods, such as experimental, *in vivo* , *in vitro studies* , or *literature reviews* . Research using animal models, laboratory tests, antibacterial tests, topical formulations, and secondary metabolite analysis were included as long as they were related to the potential of kirinyuh leaves as a wound treatment (Harfiani *et al* ., 2022). Articles must contain complete research data, including research objectives, research methods, research results, discussions, and conclusions, so that the data can be analyzed systematically (Wulandari, Wirasutisna, Mariani, & Wibowo, 2024).

Exclusion Criteria

Articles were excluded if they did not discuss wound healing or were unrelated to the pharmacological activity of kirinyuh leaves on wounds. Articles with incomplete research data, duplicate articles, articles without full access, and articles containing only opinions or news were excluded (Vinata, 2025). Studies that only discussed the activity of kirinyuh leaves for other diseases unrelated to wound healing, such as studies on antihypercholesterolemia or antidiabetic drugs without a link to wounds, were excluded from the final selection. Articles in languages other than Indonesian and English were also excluded due to limitations in data translation (Salsabil, Ardana, Larastiyasa, Pratiwi, Widianti, & Pratama, 2022).

Article Selection Stages

Article selection was conducted using the *Preferred Reporting Items for Systematic Reviews and Meta-Analyses*) process. The selection process involved identification, *screening* , *eligibility* , and *inclusion* to ensure the articles truly align with the research focus (Putry, Harfiani, & Tjang, 2021).

Table 3Article Selection Stages

PRISMA Stages	Article Selection Process	Number of Articles
Identification	Article found from Google Scholar	102
Identification	Article found from PubMed	21
Identification	Article found from ScienceDirect	18
Identification	Article found from Semantic Scholar	25
Identification	Article found from Garuda	14
Identification	Article found from Crossref	6
Identification	Total initial articles found	186
Identification	Duplicate articles removed	37
Screening	Articles entering the *screening stage*	149
Screening	Articles were excluded because they did not discuss wound healing, did not use kirinyuh leaves as the main ingredient, or discussed other activities unrelated to wounds.	68
Screening	Articles that pass the *screening stage*	81
Eligibility	Full text articles checked	81
Eligibility	Articles were excluded due to incomplete data, unclear methods, unavailable full text, or content not matching the research focus.	40
Eligibility	Articles that meet the final analysis requirements	41
Included	Final article used in *systematic literature review*	41

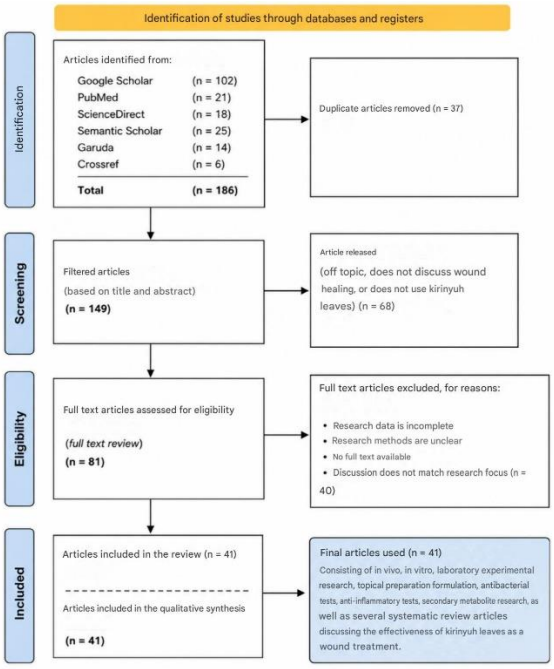

Figure 3Article Selection Stages

Source: PRISMA Shiny App, Processed by Researchers (2026)**Identification**

During the identification stage, 186 articles were found in various databases, including 102 articles from Google Scholar, 21 articles from PubMed, 18 articles from ScienceDirect, 25 articles from Semantic Scholar, 14 articles from Garuda, and 6 articles from Crossref. All articles were collected and checked for title, publication year, and relevance to the research topic. At this stage, 37 duplicate articles were found and excluded from the selection process.

Screening

screening phase involved reading the titles and abstracts of the articles. At this stage, 68 articles were excluded because they did not discuss wound healing, did not use kirinyuh leaves as the primary research material, or only discussed

other pharmacological activities unrelated to wounds. After the *screening process* was completed, 81 articles remained and were included in the next stage.

Eligibility

eligibility stage was conducted by reading the full texts of the articles (*full-text review*). At this stage, 40 articles were excluded due to incomplete research data, unclear research methods, lack of full text, or discussions that did not align with the research focus. After the eligibility process was completed, 41 articles were included in the final analysis.

Included

A total of 41 articles were included in this study. These include in *vivo* and *in vitro studies* , laboratory experimental studies, topical formulations, antibacterial and anti-inflammatory tests, secondary metabolite studies, and several *systematic reviews* discussing the effectiveness of kirinyuh leaves in wound treatment. These articles were then analyzed and compiled into the discussion of this *systematic literature review* (Putry, Harfiani, & Tjang, 2021).

PRISMA Diagram

The PRISMA diagram in this study illustrates the flow of the search and selection process for scientific articles from the identification stage to the final article used in this study.

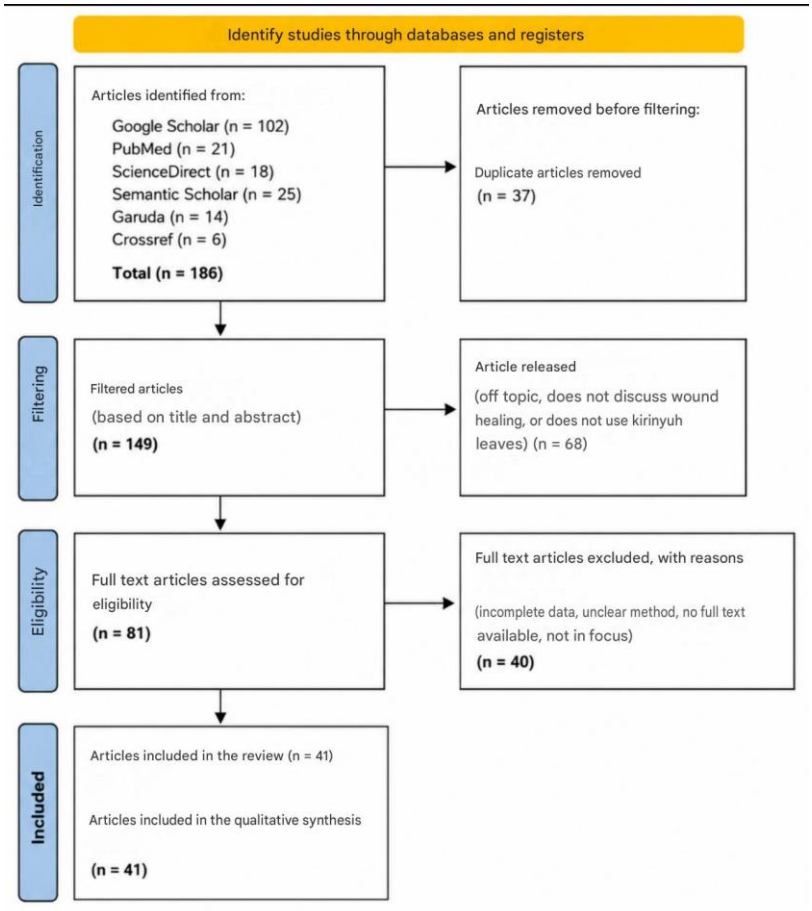

Figure 4PRISMA Diagram (Indonesian)
Source: PRISMA Shiny App, Processed by Researchers (2026)

A total of 186 articles were identified in all search databases. After duplication checking,A total of 37 articles were discarded because the article data were the same or appeared repeatedly in several search databases. After the title and abstract *screening process* was carried out, 68 articles were excluded because they did not match the research focus, did not discuss wound healing, or did not use kirinyuh leaves as the main research material. At the *eligibility stage* , 40 articles were excluded because the article content was incomplete, the research method was unclear, or the article was not available in *full text form* . After all selection stages were completed, 41 scientific articles were obtained and used as the main source in *the systematic literature review* regarding the potential of kirinyuh leaves (*Chromolaena odorata*) as a wound treatment.

RESULTS AND DISCUSSION

Article Selection Results

The search for articles from various databases produced 186 articles related to kirinyuh leaves (*Chromolaena odorata*) as a wound treatment.

Table 4Article Selection

Selection Stages	Number of Articles
Articles resulting from initial identification	186
Duplicate articles	37
Article after duplication is removed	149
Articles issued during *screening*	68
Articles remaining after *screening*	81
Articles issued during *eligibility*	40
The final article used	41

Articles were obtained from Google Scholar, PubMed, ScienceDirect, Semantic Scholar, Garuda, and Crossref. After a duplication check, 37 articles were excluded due to repeated occurrences of the same data in multiple databases. The title and abstract *screening* phase excluded 68 articles due to their inconsistency with the research focus. In the *eligibility phase* , 40 articles were again excluded due to the lack of *full text* , unclear research methods, or discussions not directly related to wound healing. After completing all stages, 41 final articles were obtained, which were used in this *systematic literature review* (Putry, Harfiani, & Tjang, 2021).

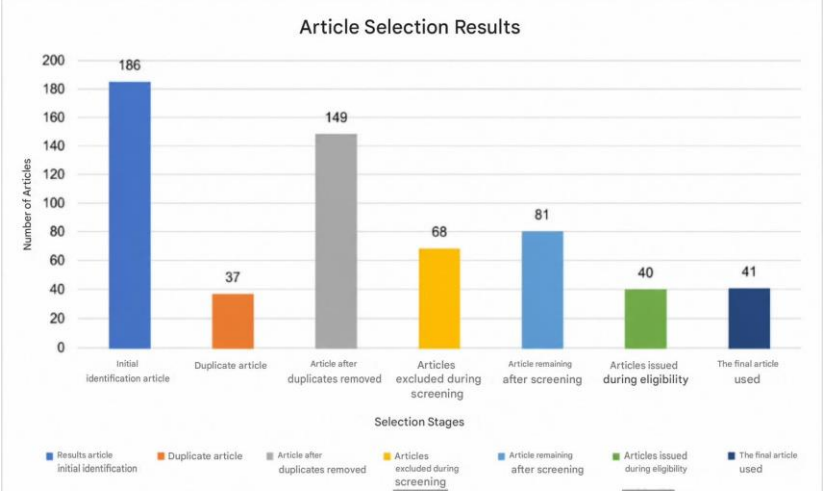

Figure 5Article Selection

Source: Lucidchart Pro, Processed by Researchers (2026)**PRISMA Diagram**

The PRISMA diagram shows the article screening process from identification to the final articles used in this study. A total of 186 articles were selected for the identification stage.

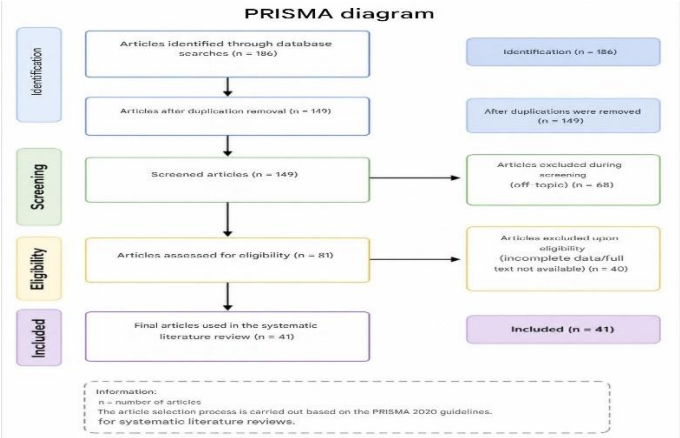

Figure 6PRISMA Diagram

Source: PRISMA Shiny App, Processed by Researchers (2026)

After removing duplicate articles, 149 articles remained. The *screening* phase excluded 68 articles that were inconsistent with the research topic. The *eligibility phase* excluded 40 articles because of incomplete or unavailable *full-text data* . The final results showed that 41 articles were used as the primary sources for this *systematic literature review* (Putry, Harfiani, & Tjang, 2021).

Table 5Years of Article Publication (2017 - 2026)

Year	Number of Articles
2017	1
2018	1
2019	1
2020	3
2021	8
2022	15
2023	7
2024	3
2025	2
2026	0

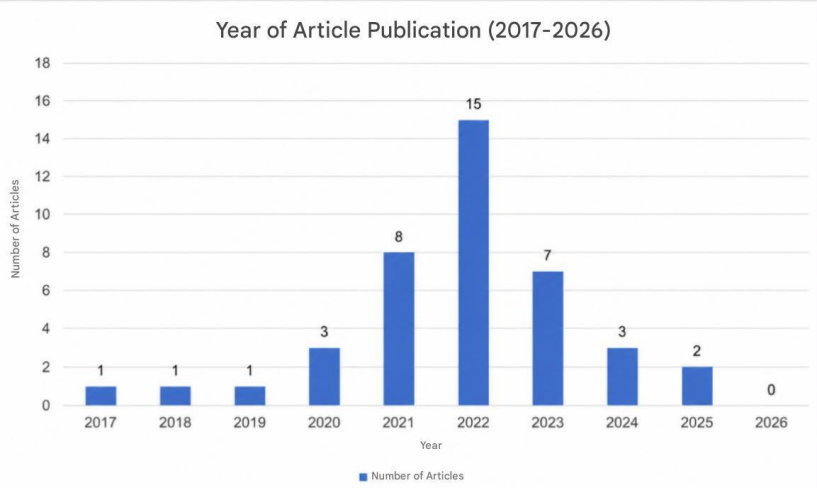

Figure 7Graph of Article Publication Years (2017 - 2026)
Source: Lucidchart Pro, Processed by Researchers (2026)

Publication data show a significant increase in research on kirinyuh leaves between 2021 and 2023. The highest number of publications was in 2022, with numerous studies discussing the antibacterial and anti-inflammatory activities, gel, serum, spray, and ointment formulations of Kirinyuh leaves for wound healing. This increase in research indicates that kirinyuh leaves are increasingly being investigated as a herbal ingredient for modern wound therapy (Harfiani *et al* ., 2022).

Table 6Research Method Analysis

Research methods	Number of Articles
Laboratory experiments	15
In vivo	11
In vitro	5
Literature review	5
Systematic review	2
Phytochemical analysis	2
GC-MS / UPLC-MS	1

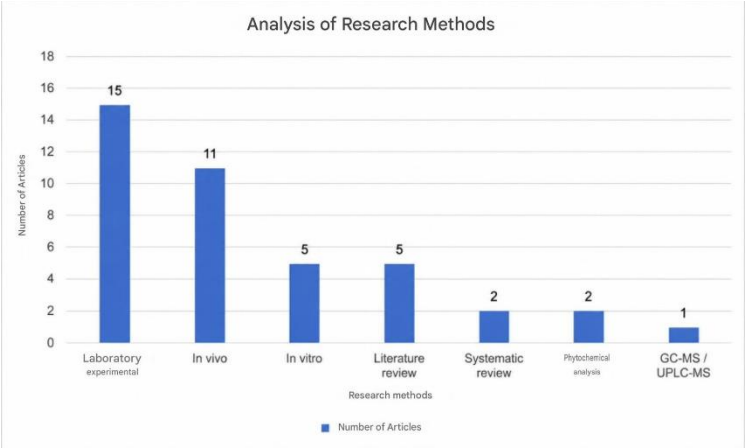

Figure 8Research Method Analysis
Source: Lucidchart Pro, Processed by Researchers (2026)

The analysis of research methods shows that laboratory experimental studies are the most widely used method. This type of research was chosen because it can directly demonstrate the effects of kirinyuh leaves on wound healing, bacterial growth, collagen formation, and angiogenesis. *In vivo studies* have been conducted on rats, mice, guinea pigs, and rabbits are also numerous because they can directly demonstrate the wound healing process in body tissues (Efendi, Elisma, & Zahira, 2023).

Table 7Compound Content of Kirinyuh Leaves

Active Compounds	Number of Articles Discussing
Flavonoid	27
Tannin	18
Saponin	16
Alkaloid	15
Phenol	12
Terpenoid	9
Steroid	7
Essential oil	6
Germacrene D	3
Pyranoflavones	2

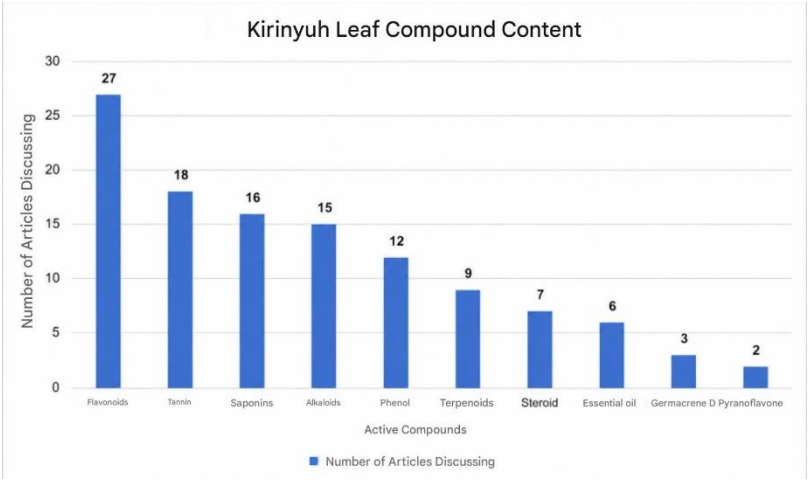

Figure 9Graph of Kirinyuh Leaf Compound Content
Source: Lucidchart Pro, Processed by Researchers (2026)

Research shows that Flavonoids are the most commonly found compounds in the leaves of this plant. These compounds exhibit anti-inflammatory, antioxidant, antibacterial, and wound healing activities. Tannins and saponins

are also frequently found, as they facilitate collagen formation and accelerate wound healing (Ratmini & Tedjasulaksana, 2024).

Table 8Article Characteristics

No	Researchers	Year	Types of research	Dosage Form	Research Focus
1	Emil & Emil	2025	Experimental	Spray	External wound healing
2	Fratiwi *et al* .	2022	Laboratory	Ethanol extract	Anti-inflammatory
3	Wulandari *et al* .	2020	*In vivo*	Topical extract	Collagen formation
4	Panjaitan *et al* .	2023	*In vivo*	20% and 40% extract	Angiogenesis
5	Efendi *et al* .	2023	*In vivo*	Extract fraction	Cut
6	Fauzi *et al* .	2021	Experimental	Essential oil gel	Burns
7	Zain *et al* .	2022	*In vivo*	Combination gel	Diabetic wounds
8	Putri *et al* .	2022	*In vivo*	Combination serum	Diabetic wounds
9	Fadila *et al* .	2022	Laboratory	Cream	Stability of wound medication
10	Nurlely *et al* .	2022	Laboratory	Gel	Physical stability
11	Dewi *et al* .	2023	Laboratory	Ointment	Antibacterial
12	Juwairiah & Roebiakto	2022	Laboratory	Essential oil	Antibacterial
13	Yunus *et al* .	2019	Laboratory	Leaf juice	Antibacterial
14	Gultom *et al* .	2021	Experimental	Extract fraction	resistant bacteria
15	Putry *et al* .	2021	*Systematic review*	Literature	Wound effectiveness

Table 9Article Summary

Researchers	Core Research Results
Emil & Emil (2025)	Kirinyuh extract spray accelerates the healing of external wounds within 120 hours
Wulandari *et al* . (2020)	10% extract increases collagen formation the most
Panjaitan *et al* . (2023)	40% extract accelerates angiogenesis better than povidone iodine
Efendi *et al* . (2023)	Ethyl acetate fraction provides the best wound healing
Fauzi *et al* . (2021)	1.5% essential oil gel is effective for burns
Zain *et al* . (2022)	Kirinyuh-curcumin combination gel is effective for diabetic wounds
Putri *et al* . (2022)	Combination serum provides the highest diabetic wound healing of 68.068%
Dewi *et al* . (2023)	Kirinyuh ointment inhibits Staphylococcus aureus
Juwairiah & Roebiakto (2022)	Kirinyuh essential oil is effective in inhibiting E. coli and S. aureus
Gultom *et al* . (2021)	Kirinyuh extract is active against antibiotic-resistant bacteria.

Table 10Contents of Kirinyuh Leaves

Contents	Function in Wounds
Flavonoid	Anti-inflammatory and antioxidant
Tannin	Stops bleeding and accelerates wound closure
Saponin	Facilitates collagen formation
Alkaloid	Antibacterial
Phenol	Inhibits bacterial growth
Terpenoid	Facilitates tissue regeneration
Steroid	Suppress inflammation
Essential oil	Natural antiseptic

Research Result

The 41 articles in this study were selected based on the PRISMA selection process. The identification stage identified 186 articles from various databases. After checking for duplication, 37 articles were excluded due to repeated occurrences of the same data, leaving 149 articles. The title and abstract *screening stage* excluded 68 articles again for not matching the research focus, leaving 81 articles. Furthermore, the *eligibility stage* excluded 40 articles due to the lack of full text, unclear research methods, or discussions not directly related to wound healing. Based on all selection stages, 41 final articles were obtained for use in this *systematic literature review* . This number also corresponds to the total data in Table 5 (Year of Article Publication) and Table 6 (Research Method Analysis), which each yield a total of 41 articles. Meanwhile, the number in Table 7 (Compound Content of Kirinyuh Leaves) does not

have to be 41 because one article can discuss more than one type of active compound. Table 8 displays only a portion of the core articles most frequently discussed in research, thus not including all 41 articles.

A *systematic literature review* shows that kirinyuh leaves contain numerous secondary metabolites that support the wound healing process. The most frequently found compounds are flavonoids, tannins, saponins, alkaloids, phenols, steroids, and terpenoids. These compounds have anti-inflammatory, antibacterial, antioxidant, hemostatic, and regenerative activities that facilitate every phase of wound healing, from hemostasis to re-epithelialization (Harfiani *et al* ., 2022). Research shows that flavonoids are the most dominant compound in kirinyuh leaves. This compound can reduce inflammatory mediators and suppress IL-6 levels, thereby speeding up wound healing (Fratiwi, Saranani, Agastia, & Isrul, 2022). Other research has also found that flavonoids facilitate the formation of new blood vessels, or angiogenesis, thereby increasing the supply of oxygen and nutrients to the wound area (Panjaitan, Telussa, Sihotang, & Sasputra, 2023). Tannins in kirinyuh leaves are known to have astringent and hemostatic effects, helping to stop minor bleeding in wounds. Tannins can also form a protective layer on wound tissue, making it more difficult for bacteria to enter the damaged area (Ningsih *et al* ., 2024). Saponins in kirinyuh leaves facilitate collagen formation, allowing wound tissue to heal more quickly and strengthen (Wulandari, Handajani, & Rosanto, 2020). Antibacterial research shows that kirinyuh leaves can inhibit various bacteria that cause wound infections, such as *Staphylococcus aureus, Escherichia coli* , *Salmonella typhi* , *Pseudomonas aeruginosa* , and antibiotic-resistant bacteria such as MRSA and ESBL (Gultom *et al* ., 2021). The greatest antibacterial activity was found in essential oils and high-concentration ethanol extracts (Juwairiah & Roebiakto, 2022).

The most commonly used kirinyuh leaf preparations include gels, ointments, creams, serums, sprays, essential oils, and topical extracts. Gel preparations are widely used because they are easily absorbed by the skin and are physically stable (Nurlely, Rahmah, Ratnapuri, & Srikartika, 2022). Spray preparations are also considered practical and hygienic because they do not require direct hand contact with the wound area (Emil & Emil, 2025). *In vivo studies* in rats, mice, guinea pigs, and rabbits have shown that kirinyuh leaves can accelerate wound healing, improve epithelial thickness, increase fibroblast count, increase collagen formation, and accelerate angiogenesis (Efendi, Elisma, & Zahira, 2023). In diabetic wounds, the combination of kirinyuh essential oil and curcumin resulted in healing rates of up to 68.068% by day 20 (Putri, Idacahyati, & Zain, 2022).

Research on burns showed that a 30% concentration of N-hexane extract of kirinyuh leaves resulted in an average healing rate of 79% on day 21 (Muhaira *et al* ., 2024). Another study on burns also found that 1.5% kirinyuh essential oil gel resulted in a healing rate of 21.77%, almost equivalent to Bioplacenton as a positive control (Fauzi, Idacahyati, & Gustaman, 2021). The study showed differences in antibacterial inhibitory effects. Research (Sari and Niken, 2021) found that the inhibitory effect of kirinyuh leaf extract on *Staphylococcus aureus* was still weak to moderate. These results differ from research (Gultom *et al* ., 2021) which found quite strong antibacterial activity against antibiotic-resistant bacteria. These differences in results are influenced by the type of solvent, extraction method, dosage form, extract concentration, and type of test bacteria. Toxicity studies show that ethanol extract of kirinyuh leaves is still considered safe at high doses of up to 15 g/kg body weight because it did not cause death in test animals and did not cause significant liver and kidney damage (Tedjasulaksana & Ratmini, 2023). These results indicate that kirinyuh leaves still have good potential for development as a pharmaceutical product for wound treatment.

Discussion

The results of various studies indicate that kirinyuh leaves (*Chromolaena odorata*) have enormous potential as a wound treatment because they can work at many stages of wound healing, from stopping bleeding, suppressing inflammation, fighting bacteria, accelerating collagen formation, to facilitating new tissue formation and wound closure. Almost all studies have shown positive results, whether in the form of extracts, essential oils, gels, serums, ointments, sprays, or creams. A *systematic review* even stated that kirinyuh leaves work through antioxidant, anti-inflammatory, antibacterial, hemostatic, cell proliferation, and re-epithelialization effects, thus accelerating the wound healing process (Putry, Harfiani, & Tjang, 2021). Similar results were also seen in other literature reviews, which stated that kirinyuh has broad pharmacological activity and is highly suitable for development as a modern herbal pharmaceutical ingredient (Harfiani *et al* ., 2022). Ethnopharmacognosy studies also show that the traditional use of kirinyuh as a wound medicine has long been carried out by the community and is proven to be supported by active chemical compounds that work together to accelerate tissue recovery (Wulandari, Wirasutisna, Mariani, & Wibowo, 2024).

When compared between studies, one of the strongest results was seen in the study of IIA-degree burns with a 30% concentration of n-hexane extract of kirinyuh leaves, which achieved an average healing rate of 79% on day 21, making this study one of the most effective in accelerating burn wound closure (Muhaira *et al* ., 2024). Another very high percentage of wound healing was observed in a study on the ethyl acetate fraction of the ethanol extract of kirinyuh leaves, which showed a wound healing of 73-75%, accompanied by improvements in collagen and epithelial thickness in rat skin tissue (Efendi, Elisma, & Zahira, 2023). In a study of serum combinations of kirinyuh essential oil and curcumin, the results of diabetic wound healing reached 68.068% at the best dose, while the combination gel preparation provided healing of 62.613%, thus proving that the combination of active ingredients strengthens the healing process of chronic wounds, such as diabetic wounds (Putri, Idacahyati, & Zain, 2022). Other research shows

that a spray of kirinyuh ethanol extract can heal external wounds within 120 hours with a narrowing of the wound by 0.7 - 1.1 cm every 24 hours, so the spray form is considered practical and effective for external wounds (Emil & Emil, 2025).

The most frequently found compounds in almost all studies were flavonoids. This compound has been studied for its anti-inflammatory, antibacterial, burn healing, angiogenic, fibroblastic, and metabolic properties using UPLC-MS and GC-MS (Fratiwi, Saranani, Agastia, & Isrul, 2022). Flavonoids can as being able to suppress inflammatory mediators, ward off free radicals, accelerate the formation of new blood vessels, and facilitate collagen formation, thus speeding wound healing (Panjaitan *et al*., 2023). In addition to flavonoids, other frequently occurring compounds include tannins, saponins, alkaloids, phenols, steroids, and terpenoids (Harfiani *et al*., 2022). Tannins are known to help stop minor bleeding and form a protective layer on wounds to prevent bacterial entry (Ningsih *et al*., 2024). Saponins facilitate collagen formation and new tissue formation during the proliferation phase (Wulandari, Handajani, & Rosanto, 2020). Alkaloids and phenols are often associated with antibacterial and antioxidant effects that facilitate the maintenance of stable wound tissue (Nayaken, Hakim, & Alawiyah, 2023).

The similarity in results between studies is very clear in the ability of kirinyuh leaves to suppress the growth of bacteria that cause wound infections. Many studies have shown a zone of inhibition against Staphylococcus aureus and Escherichia coli, both in the form of extracts, essential oils, gels, ointments, and extract fractions (Juwairiah & Roebiakto, 2022). Antibacterial research on essential oils even showed an inhibition zone reaching 14.4 mm in S. aureus and 15.8 mm in E. coli at a dose of 30 µL, so its antibacterial activity is considered strong (Juwairiah & Roebiakto, 2022). Other research on MDRO bacteria such as MRSA and ESBL also showed that ethanol extract of kirinyuh leaves can still produce an average inhibition zone of 11.6 mm, so kirinyuh is considered to have great potential as a herbal antibacterial for difficult-to-treat wound infections (Gultom *et al.*, 2021). Similar antibacterial activity was found in the study by Fitriana *et al*. which showed the presence of active antibacterial spots on TLC bioautography for S. aureus, S. epidermidis, and Propionibacterium acnes (Fitriana, Nurung, Naid, & Umarella, 2021).

Although many studies have yielded positive results, some have shown weaker ones. Research by Yulia Ratna Sari and Niken showed that the inhibitory effect of kirinyuh leaf extract on Staphylococcus aureus was only 6.6 mm at 100% concentration, thus categorizing its antibacterial activity as weak to moderate (Sari & Niken, 2021). Even lower results were observed by Armilah *et al*., who used freshly squeezed kirinyuh leaf juice on bacteria from acne sufferers, found that no inhibition zone was formed at any concentration (Armilah *et al.*, 2022). These differences in results are thought to be due to differences in dosage form, extraction method, solvent type, active ingredient concentration, bacterial type, and bacterial resistance tested in each study. Nayaken *et al*. demonstrated that the maceration method produced higher alkaloid levels than the ultrasonic method, suggesting that the extraction method significantly influences the strength of the active compounds produced (Nayaken, Hakim, & Alawiyah, 2023).

Another difference is observed in the dosage form used. Several studies have shown that gel, serum, and cream forms provide good physical stability for topical use because they have a skin-compatible pH, are homogeneous, stable during storage, and spread easily on the wound surface (Fadila, Syaifiyatul H., & Hasanah, 2022). Nurlely *et al* . reported that a gel formula with a combination of HPMC and carbopol can maintain viscosity stability, adhesiveness, and spreadability, making it suitable for use as a wound preparation (Nurlely, Rahmah, Ratnapuri, & Srikartika, 2022). Research by Munandar and Nugroho showed that the type of ointment base affects antibacterial activity, because a hydrocarbon base can release the active ingredient better than an absorption base that does not produce an inhibition zone at all (Munandar & Nugroho, 2017). This indicates that the quality of pharmaceutical preparations significantly determines the success of wound therapy using kirinyuh leaves.

Other studies have shown that kirinyuh leaves not only act as an antibacterial agent but also facilitate the formation of new tissue. Research on post-tooth extraction wounds showed that a 10% concentration of kirinyuh leaf extract increased collagen fiber density the most compared to other concentrations (Wulandari, Handajani, & Rosanto, 2020). Research on angiogenesis in incision wounds showed that a 40% kirinyuh extract resulted in higher new blood vessel formation than 10% povidone iodine (Panjaitan *et al* ., 2023). Another study on rabbit nasal mucosa showed that the greatest increase in fibroblast numbers occurred at 10% concentration (Husni, Rahmawati, & Irnawati, 2022). These results demonstrate that kirinyuh not only prevents wound infections but also accelerates new tissue formation and repairs damaged skin or mucosal structures.

Safety aspects have also been discussed in several studies. Acute toxicity research by Tedjasulaksana and Ratmini showed no deaths in mice up to a dose of 15 g/kg body weight, and no significant liver or kidney damage was found. Therefore, the kirinyuh leaf extract was classified as practically non-toxic at the study dose (Tedjasulaksana & Ratmini, 2023). These results strengthen the potential for developing kirinyuh leaves as a herbal medicine ingredient because, in addition to being effective, this ingredient also demonstrated a good level of safety in test animals.

In general, all studies showed nearly identical results: Kirinyuh leaves have significant potential to facilitate wound healing through antibacterial, anti-inflammatory, antioxidant, angiogenic, collagen formation, fibroblast, and tissue regeneration. Flavonoids are the most consistent constituents in nearly all studies and are frequently associated with successful wound healing. The differences in the results between studies are largely influenced by the extraction methods, dosage forms, dosages, solvents, wound types, and bacterial strains tested in each study. Based on the available results, Kirinyuh leaves are highly suitable for the development of modern pharmaceutical products, such as

gels, serums, ointments, sprays, and creams, for the treatment of external wounds, burns, diabetic wounds, and bacterial infections (Putry, Harfiani, & Tjang, 2021).

CONCLUSION

The results of *a systematic literature review* of 41 articles show that kirinyuh leaves (*Chromolaena odorata*) have great potential as a wound treatment ingredient because they contain active compounds such as flavonoids, tannins, saponins, alkaloids, phenols, terpenoids, steroids, and essential oils that work as anti-inflammatory, antibacterial, antioxidant, hemostatic, and facilitate wound tissue regeneration. Flavonoids are the most frequently found compounds and are most associated with accelerating wound healing because they can suppress inflammation, increase angiogenesis, and facilitate collagen formation. The results of the study showed that kirinyuh leaves are effective in facilitating the healing of various types of wounds such as external wounds, cuts, burns, diabetic wounds, and bacterial infections through the form of gel, serum, spray, ointment, cream, extract, and essential oil preparations. The most effective research was found in n-hexane extract at a concentration of 30% on burns with a healing rate of up to 79%, while other studies showed an increase in collagen, fibroblasts, angiogenesis, and inhibition of bacteria such as Staphylococcus aureus, Escherichia coli, MRSA, and ESBL. Although there are some differences in results between studies, in general, all articles show the same direction of results, namely that kirinyuh leaves have great potential to be developed into a modern herbal pharmaceutical ingredient for wound treatment (Putry, Harfiani, & Tjang, 2021).

Research on kirinyuh leaves as a wound treatment requires further investigation, particularly in human clinical trials, to directly demonstrate their safety and efficacy for medical use. Future research is expected to utilize more uniform extraction methods, solvent types, and concentrations to facilitate the comparison of results across studies. The development of dosage forms, such as gels, serums, sprays, and creams, is also essential to ensure stable, safe, practical, and comfortable products. Research on long-term toxicity, active ingredient stability, and the mechanisms of action of each kirinyuh leaf compound should be expanded to ensure the development of high-quality, scientifically sound pharmaceutical products based on kirinyuh.

REFERENCE

Ance, PE, Wijaya, S., & Setiawan, HK (2018). Standardization of kirinyuh leaves (*Chromolaena odorata*) and dried simplicia from three different regions. *Journal of Pharmacy Science and Practice, 5* (2), 79 - 86. https://doi.org/10.33598/jpsp.v5i2.118

Armilah, Basarang, M., Widyanti, T., & Anita. (2022). Inhibitory test of kirinyuh leaf juice (*Chromolaena odorata* L.) on bacteria isolated from acne sufferers. *Jurnal Medika: Media Ilmiah Analis Kesehatan, 7* (2), 70 - 75. https://doi.org/10.35728/jmiak.v7i2.214

Damayanti, E., & Maryati, M. (2025). Antibacterial test of kirinyuh leaf extract (*Chromolaena odorata* L.) and bay leaf extract (*Syzygium polyanthum*) against *Pseudomonas aeruginosa* and *Bacillus subtilis* . *Usadha: Journal of Pharmacy, 4* (1), 1 - 15. https://doi.org/10.55989/ujp.v4i1.441

Dewi, E., Agustina, R., Nuzullian, D., & Murdani, K. (2023). Analysis of the potential of kirinyu antimicrobial herbal ointment (*Chromolaena odorata*) on the growth of *Staphylococcus aureus* to improve student soft skills in microbiology courses. In *Proceedings of the 2nd International Conference on Social Science, Education and Humanities* (pp. 112 - 120). Jabal Ghafur University Press. https://doi.org/10.21070/icseh.v2i1.332

Efendi, MR, Elisma, E., & Zahira, N. (2023). Evaluation of the wound healing activity of ethanol extract fractions from kirinyuh leaves (*Chromolaena odorata* (L.) RM King & H. Rob) on incisional wounds in white rats (*Rattus norvegicus*). *Journal of Pharmaceutical and Sciences, 1* (Suppl. 1), 91 - 98. https://doi.org/10.36490/jps.v1isuppl1.514

Emil, RP, & Emil, MFP (2025). Potential of ethanol extract of kirinyuh weed (*Chromolaena odorata*) as a *wound medicine spray* for external wounds. *Proceedings of the National Seminar on Science and Technology Series IV, 2* (2), 57 - 65. https://doi.org/10.31289/snst.v2i2.782

Fadia, Nurlailah, Herlina, TE, & Lutpiatina, L. (2020). Effectiveness of ethanol extract of kirinyuh leaves (*Chromolaena odorata* L.) as an antibacterial against *Salmonella typhi* and *Staphylococcus aureus* . *Indonesian Journal of Pharmaceutical Research, 2* (3), 158 - 168. https://doi.org/10.33759/jrki.v2i3.144

Chromolaena odorata) cream preparation as a wound medicine. In *Proceeding SENADA (National Seminar on World Health)* (Vol. 1, No. 1, pp. 162 - 166). https://doi.org/10.56741/senada.v1i1.209

Fauzi, R., Idacahyati, K., & Gustaman, F. (2021). Testing the effectiveness of kirinyuh leaf essential oil gel (*Chromolaena odorata* L.) on healing burns in male white Wistar rats. *Journal of Pharmacopolium, 1* (1), 1 - 12. https://doi.org/10.36465/jop.v1i1.86

Fitriana, Nurung, AH, Naid, T., & Umarella, DR (2021). Antibacterial activity of ethanol extract of kirinyuh leaves (*Chromolaena odorata* (L.) RM) by TLC bioautography. *As-Syifaa Journal of Pharmacy, 13* (1), 43 - 47. https://doi.org/10.33096/asysyifaa.v13i1.712

Fratiwi, N., Saranani, S., Agastia, G., & Isrul, M. (2022). Anti-inflammatory activity of ethanol extract of kirinyuh leaves (*Chromolaena odorata* L.) and its effect on *Interleukin 6* (IL-6) levels in male Wistar rats. *Jurnal Pharmacia Mandala Waluya, 1* (2), 54 - 67. https://doi.org/10.54883/jpmw.v1i2.144

Gaspersz, N., Fransina, EG, & Ngarbingan, AR (2022). Test of the inhibitory activity of α -amylase and glucoamylase enzymes from the ethanol extract of kirinyuh leaves (*Chromolaena odorata* L.). *Mulawarman Journal of Chemistry, 19* (2), 51 - 57. https://doi.org/10.30872/jkm.v19i2.771

Gultom, ES, Hartanti, T., Maritsa, H., & Prasetya, E. (2021). Antibacterial activity test on ethanol extract fraction of Kirinyuh (*Chromolaena odorata* L.) leaves for *multi-drug resistant* organisms bacteria. *Biogenesis: Scientific Journal of Biology, 9* (1), 26-34. https://doi.org/10.24252/bio.v9i1.20142

Harfiani, E., Nugraha, Y., Aprilia, CA, Makkiyah, FA, Puspita, R., Kharisma, VD, *et al* . (2022). The phytochemical and pharmacological activity of extract Kirinyuh (*Chromolaena odorata* L.) leaves: A *review* . *Pharmacognosy Journal, 14* (5), 580-586. https://doi.org/10.5530/pj.2022.14.145

Husni, TTR, Ismail, I., & Maurieza, K. (2022). The effect of ethanol extract of kirinyuh leaf (*Chromolaena odorata* L.) on the allergy healing of rabbits (*Lepus curpaneums*). *Journal of Syiah Kuala Dentistry Society, 7* (2), 97 - 105. https://doi.org/10.24815/jskds.v7i2.24821

Husni, TTR, Rahmawati, N., & Irnawati, I. (2022). Effectiveness of ethanol extract of kirinyuh leaf (*Chromolaena odorata* L.) on the increase of the fibroblasts and angiogenesis in the nose mucosa of rabbit (*Lepus curpaneums*). *Journal of Syiah Kuala Dentistry Society, 7* (2), 86 - 92. https://doi.org/10.24815/jskds.v7i2.24818

Juwairiah, & Roebiakto, E. (2022). The effectiveness of kirinyuh (*Chromolaena odorata* L.) leaf essential oil as an antibacterial for *Staphylococcus aureus* and *Escherichia coli* . *Tropical Health and Medical Research, 4* (2), 44 – 49. https://doi.org/10.35916/thmr.v4i2.118

Makin, FMPR, Tnunay, IMY, & Wiguna, GA (2023). GC-MS (*Gas Chromatography-Mass Spectrometry*) of secondary metabolites of ethanol and methanol extracts of kirinyuh leaves (*Chromolaena odorata* L.). *Bioscientist: Scientific Journal of Biology, 11* (1), 194 - 202. https://doi.org/10.33394/bioscientist.v11i1.7341

Muhaira, WT, Luthvia, L., Wahyuni, N., Simatupang, IA, & Ariatama, B. (2024). Testing of N-hexane extract of kirinyuh leaves (*Chromolaena odorata* L.) on an animal model of IIA degree burns. *JRIKUF: Journal of General Health Science Research, 2* (4), 124 - 136. https://doi.org/10.57218/jrikuf.v2i4.322

Chromolaena odorata) leaf extract ointment and absorption against *Staphylococcus aureus* . *Journal of Pharmaceutical Science and Practice, 3* (1), 11 - 18. https://doi.org/10.31603/pharmacy.v3i1.1027

Munira, M., Rasidah, Zakiah, N., & Nasir, M. (2022). Identification of chemical compounds and antibacterial activity test of kirinyuh leaf extract (*Chromolaena odorata* L.) from Ie Seum geothermal area, Regency of Aceh Besar, Indonesia. *Rasayan Journal of Chemistry, 15* (4), 2852-2857. https://doi.org/10.31788/RJC.2022.1546995

Nayaken, PO, Hakim, AR, & Alawiyah, T. (2023). Effect of extraction method on total alkaloid content of kirinyuh (*Chromolaena odorata*) leaf extract. *Indonesian Journal of Pharmacy and Natural Products, 6* (2), 194 - 201. https://doi.org/10.35473/ijpnp.v6i2.261

Ningsih, P., Pratiwi, N., Supriadi, Ahmar, DS, Tiwow, VM, Pulukadang, SHV, & Rahmawati, S. (2024). Quantification of tannin in *Chromolaena odorat* (Kirinyu) leaf extract. *International Journal of Design & Nature and Ecodynamics, 19* (4), 1341 - 1346. https://doi.org/10.18280/ijdne.190426

Nurlely, Rahmah, A., Ratnapuri, PH, & Srikartika, VM (2022). Physical stability test of ethanol extract gel preparation of kirinyuh leaves (*Chromolaena odorata* L.) with variations of HPMC and carbopol. *Proceedings of the National Seminar on Wetland Environment, 7* (2), 243 - 249. https://doi.org/10.20527/psnlb.v7i2.912

Nurlely, Rahmah, A., Ratnapuri, PH, Srikartika, VM, & Anwar, K. (2021). Test the physical characteristics of a gel preparation of kirinyuh leaf extract (*Chromolaena odorata* L.) with variations of carbopol and HPMC. *Journal of Pharmascience, 8* (2), 79 – 89. https://doi.org/10.20527/jps.v8i2.10291