

Systematic Review

The Role of African Medicinal Plants in Dermatological Treatments: A Systematic Review of Antimicrobial, Wound-Healing and Melanogenesis Inhibition

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Abstract

Background: Medicinal plants are widely used across the globe as complementary and alternative therapies for managing various health conditions. The use of medicinal plants is a fundamental component of the African traditional healthcare system and most diverse therapeutic practices. Africa harbors a variety of plant species, many of which are estimated to be endemic, making it a rich source of medicinal plants with potential relevance to human health. **Aim of the study:** The study aimed to review and highlight the information in the literature related to the antimicrobial activity, wound-healing activity, and melanogenesis inhibition of African medicinal plants. **Methods:** Following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) guidelines, a literature search was conducted on ScienceDirect, Google Scholar, Medline Ebscohost, and PubMed, which were searched for articles published between 2018 and 2024. Due to high heterogeneity and variability in study designs, data were synthesized using a narrative approach. **Result:** A total of 37 studies were included. *Emilia coccinea*, *Entada africana*, *Trichilia dregeana*, *Physalis angulata*, and *Prunus africana* demonstrated strong wound-healing activity (100%) at concentrations between 5 and 10%. For melanogenesis inhibition, *Ormocarpum trichocarpum* (IC₅₀ = 2.95 µg/mL), *Limonium cercinense* (IC₅₀ = 3 µg/mL), and *L. boitardii* (IC₅₀ = 5 µg/mL) showed the most potent effects. The strongest antimicrobial effects were reported for *Harpagophytum procumbens* (MIC = 10 µg/mL) against *Staphylococcus aureus* and *S. epidermidis* and *Pistacia atlantica* (MIC = 78.1 µg/mL) against *Listeria monocytogenes* and *Candida albicans* (MIC = 39 µg/mL). **Conclusions:** This study highlights the broad therapeutic potential of African medicinal plant extracts in addressing various health conditions, including skin infections, wound management, and skin pigmentation. While several extracts demonstrated strong bioactivity, inconsistent reporting of statistical data limited quantitative synthesis. Future studies should adopt standardized methodologies and report complete statistical outcomes to enable robust meta-analyses and support clinical translation.



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Keywords: African medicinal plants; antimicrobial; wound healing; skin pigmentation; melanogenesis inhibition

1. Introduction

Medicinal plants are widely recognized for their therapeutic potential and serve as precursors for drug development [1]. Plants are the major sources of medicines utilized in treating different diseases [2]. The African continent boasts a rich biodiversity, with numerous plant species used for medicinal purposes. Approximately 40,000–45,000 plant species exist on the continent, with around 5000 used in traditional medicine for managing various diseases, including dermatological conditions [3].

In southern Africa, more than 431 plant species have been identified as essential for traditional dermatological use. These plants have various biological properties, including anti-inflammatory, antioxidant, antimicrobial, and wound-healing properties [4]. Medicinal plants are valued for their rich content of bioactive compounds, including vitamins, essential oils, polyphenols, and flavonoids [5]. These bioactive compounds inhibit melanogenesis and tyrosinase activity, demonstrate antimicrobial, anti-inflammatory, and antioxidant effects, promote collagen deposition, and enhance the proliferation of keratinocytes and fibroblasts [6].

As the body's largest organ, the skin is a protective barrier and plays essential roles in sensory perception, immune defense, and thermoregulation [7]. Its outer layer hosts a diverse microbiota, including commensal bacteria such as *Staphylococcus*, *Corynebacterium*, and *Cutibacterium* species [8,9]. However, when the skin barrier is compromised (e.g., injury or surgery), opportunistic and pathogenic microorganisms such as *Staphylococcus aureus*, *Streptococcus pyogenes*, *Pseudomonas aeruginosa*, *Acinetobacter baumannii*, *Candida albicans*, and *Candida auris* can colonize the exposed tissue [8]. While superficial infections are often self-limiting in healthy individuals, deeper or more extensive wounds may lead to serious complications, including cellulitis, necrotizing fasciitis, or systemic sepsis, especially in patients who are immunocompromised or those with underlying conditions [10,11].

Wound healing is a complex and intricate physiological process by which the body repairs damaged tissues to restore the structure and function of injured tissue [12]. It involves a series of phases: hemostasis, inflammation, proliferation, and remodeling [13]. Hemostasis is the first stage of wound healing and involves blood coagulation, cellular processes such as leukocyte infiltration, and platelet aggregation, initiating a proliferative response [14]. Inflammation aims to prevent infection. The proliferation stage involves fibroblast migration, angiogenesis, and the formation of the extracellular matrix [15]. The remodeling phase involves the maturation and reorganization of collagen, promoting the formation of new epithelium and the development of scar tissue [15]. An estimated 6.5 million people worldwide have chronic wounds [16], representing a significant global health burden for individuals and healthcare facilities, with a significant increase in mortality and morbidity rates [17]. Several underlying conditions can impair the wound-healing process, including diabetes (e.g., diabetic foot ulcers), venous insufficiency (e.g., venous leg ulcers), prolonged pressure (e.g., pressure sores), and infections [18,19].

Conventional wound management includes cleaning and debridement to remove debris and necrotic tissue and infection control using antimicrobial agents, silver wound dressings, and silver sulfadiazine creams [20]. However, their effectiveness may be limited owing to the rise in antimicrobial resistance (AMR).

Advanced therapies, such as negative pressure wound therapy and hyperbaric oxygen therapy, help promote healing and enhance tissue regeneration [21]. However, these treatments are expensive and have side effects such as bleeding, infection, and the potential risk of cancer [22]. These limitations highlight the need for alternative, more cost-effective, and safer therapies to improve wound healing and infection control.

Dyspigmentation, especially hyperpigmentation, is one of the most prevalent dermatological disorders in humans [23]. It can negatively impact the psychological and

emotional aspects of self-perception and overall quality of life for those affected. Skin pigmentation disorders come in various forms, including melasma, post-inflammatory hyperpigmentation, and lentigo [24,25]. Melasma is mainly triggered by chronic exposure to ultraviolet (UV) radiation from the sun, which stimulates melanogenesis and leads to hyperpigmented patches, particularly on sun-exposed areas of the face [26]. Hydroquinone, arbutin, and kojic acid represent the gold standard treatment for hyperpigmentation. Although effective, hydroquinone and other treatments are related to side effects such as skin irritation, exogenous ochronosis, and mutagenesis [27].

Despite the traditional use of African medicinal plants for treating dermatological conditions, there is still a lack of compiled and critically evaluated scientific evidence focusing specifically on the efficacy of African medicinal plants in dermatological applications. This is particularly important in light of increasing antimicrobial resistance and wound healing, the harmful effects of depigmenting treatment, and the high cost of treatments. In many parts of Africa, where healthcare resources are limited, traditional medicine remains the most approachable and low-cost form of care. This systematic literature review (based on experimental evidence from 2018 to 2024) aims to summarize information related to African plants with wound-healing activity, antimicrobial activity, and melanogenesis inhibition for possible use as alternatives to treat wounds, skin infections, and skin pigmentation. It also serves to provide insight for future pharmacological investigations to improve and develop safer, affordable, plant-based dermatological products.

2. Methodology

This systematic review follows the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 and has not been registered. A search was performed using ScienceDirect, Google Scholar, Medline Ebscohost, and PubMed electronic databases. Keywords included, “African medicinal plants”, “skin infection”, “wound healing”, “wound infection”, “skin pigmentation”, “melanogenesis inhibition”, “anti-tyrosinase”, “skin lightening” and “tyrosinase inhibition”. These keywords were combined using ‘AND’ and ‘OR’ to ensure comprehensive search results. The search results were limited to articles published between January 2018 and February 2024.

Inclusion criteria: Articles on indigenous African medicinal plants, published in English between 2018 and 2024, specifically in vivo and in vitro African studies focusing on antimicrobial activity, melanogenesis inhibition, and wound healing, were included.

Exclusion criteria: Review studies, ethnobotanical studies, studies not published in English, congress abstracts, and papers whose full text could not be accessed were not included in this review.

Data Extraction: The screening process followed PRISMA 2020 guidelines. Titles and abstracts were screened for relevance, and full texts were assessed independently. Three independent reviewers assessed each paper for eligibility based on predefined criteria. Discrepancies were resolved through discussion. Data were extracted and tabulated. Table 1 summarizes articles on the plant species with their wound healing, Table 2 lists the antimicrobial properties of African plant extracts, and Table 3 shows melanogenesis inhibition in African plant extracts.

Table 1. Wound healing properties of African plant extracts (2018–2024).

Family Plant	Plant Name	Part of Plant	Extract Type	Outcomes	Control	Time Point (Day)	Reference
Acanthaceae	<i>Justicia schimperiana</i> (Hochst. ex Nees) T.Anderson	Leaves	Methanol	Improved wound contraction 91.29%, 92.83% and re-epithelialization in skin burns at 5% and 10% (<i>w/w</i>), respectively.	0.2% Nitrofurazone (94.5%)	16	[28]
Apocynaceae	<i>Caralluma europaea</i> (Guss.)	Aerial part	Achlroform lipid extract	Improved wound contraction 98.20% in skin burns in the Wistar rat at 10% (<i>w/w</i>).	Vaseline® (75%) Madecassol® 1% (90%)	21	[29]
Asphodelaceae	<i>Aloe trigonantha</i> L.C.Leach	Leaves	Gel	Enhanced wound contraction and re-epithelialization 88.43%, 93.61% at 5%, 10% (<i>w/w</i>), respectively, anti-inflammatory activity at 400 mg/kg.	Simple ointment (81.88) and 0.2% nitrofurazone (93.6%)	15	[30]
Asphodelaceae	<i>Aloe vera</i> (L.) Burm.f. + <i>Bulbine frutescens</i> (L.) Willd.	Gel Leaves	Gel Aqueous extract	Vera gel 0.25 mg/mL with Bulbine frutescens 0.75 mg/mL enhanced wound closure and increased HaCaT migration when compared with each plant alone and the untreated group.	Untreated HaCaT cells	24 h	[31]
Asteraceae	<i>Emilia coccinea</i> (Sims)	Leaves, roots and flowers	Ethanol	Wound closure 95%, 98.33%,100% at 1.25%, 2.25%, 5% (<i>w/w</i>).	Baneocin (92.50%)	16	[32]
Asteraceae	<i>Vernonia auriculifera</i> Hiern	Leave	Methanol	Wound contraction 96.27%, 97.75% and re-epithelialization at 2.5%, 5% (<i>w/w</i>) in mice.	Simple Ointment (84.88%)	16	[33]
Rosaceae	<i>Prunus africana</i> (Hook.f.) Kalkman	Bark	Methanol	Wound contraction 99.04%, 100% and re-epithelialization at 5%, 10% (<i>w/w</i>) in mice.	0.2% Nitrofurazone 100%	16	[34]
Euphorbiaceae	<i>Bridelia micrantha</i> (Hochst.) Baill.	Leaves	Methanol	Enhanced wound contraction 85%, 90%, 98% at 0.625%, 2.5%, and 10% (<i>w/w</i>).	1% Silver Sulphadiazine (100%)	12	[35]
Fabaceae	<i>Tamarindus indica</i> L.	Bark, leaves, seeds, fruits	<i>n</i> -hexane extract	Anti-inflammatory, wound-healing activities and enhanced fibroblast migration at 10 µg/mL.	Untreated fibroblast cells	24 h	[36]

Table 1. Cont.

Family Plant	Plant Name	Part of Plant	Extract Type	Outcomes	Control	Time Point (Day)	Reference
Fabaceae	<i>Parkia clappertoniana</i> Keay	Fruit	Ethanol	Improved epithelialization and wound contraction 75%, 85%, 90% at 0.3%, 1%, 3% (<i>w/w</i>).	1% Silver sulphadiazine (92%)	16	[37]
Dioscoreaceae	<i>Dioscorea bulbifera</i> L.	Leaves	Hydromethanolic	Increased percentage of wound closure in the Wistar rats 87.21%, 83.81%, 71.51% at 200, 400 and 800 mg/kg.	Petroleum jelly (25.01%)	15	[38]
Lythraceae	<i>Lawsonia inermis</i> L.	Leaves	Aqueous	Improved wound contraction 85.97% and re-epithelialization at 50% (<i>w/w</i>).	Ointment base only (96.37%)	15	[39]
Lythraceae	<i>Lawsonia inermis</i> L.	Leaves	Aqueous	Improved wound contraction 100% and re-epithelialization at 1% (<i>w/w</i>) in burn wounds in mice.	1% Silver sulphadiazine (90%)	20	[40]
Meliaceae	<i>Trichilia dregeana</i> Sond	Leaves	Methanol	Improved wound contraction 99.56%, 100% and re-epithelialization in skin burns at 5% and 10% (<i>w/w</i>).	Nitrofurazone 0.2% (99.68%)	16	[41]
Mimosaceae	<i>Entada africana</i> Guill. & Perr.	Leaves, stem	Aqueous	Enhanced wound contraction around 99.37 to 100% and re-epithelialization at 5, 10, 15% (<i>w/w</i>).	Silver sulphadiazine 1% (99.94%)	16	[42]
Musaceae	<i>Musa paradisiaca</i> L.	Stem	Aqueous	Wound contraction 93.80% at 5%, 10% (<i>w/w</i>) in albino rats.	Povidone iodine (89.77%)	16	[43]
Solanaceae	<i>Physalis angulata</i> L	Leaves	Methanol	Wound contraction at concentrations 93%, 95% 5% and 10% (<i>w/w</i>) and anti-inflammatory activity at 100 and 300 mg/kg.	1% Silver sulphadiazine (100%)	15	[44]

Table 2. Antimicrobial properties of African plant extracts (2018–2024).

Family Plant	Plant Name	Part of Plant	Extract Type	Outcomes	Reference
Anacardiaceae	<i>Pistacia atlantica</i> Desf. subsp.	Leaves	Hydro-methanolic	Antimicrobial activity against <i>S. aureus</i> (MIC = 78.125 µg/mL) and <i>L. monocytogenes</i> , <i>C. albicans</i> (MIC = 39 µg/mL).	[45]
Asteraceae	<i>Emilia coccinea</i> (Sims)	Leaves, roots and flowers	Ethanol	Antimicrobial activity against <i>S. aureus</i> , <i>E. coli</i> , and <i>P. aeruginosa</i> (MIC = 256–512 µg/mL).	[32]
Acanthaceae	<i>Justicia flava</i> (Forssk.) Vahl.				
Cecropiaceae	<i>Myrianthus arboreus</i> P.Beauv.				
Cucurbitaceae	<i>Momordica charantia</i> L.	Leaves	Aqueous /Ethanol	Antimicrobial activity against <i>P. aeruginosa</i> = 0.4–16.1 mm, <i>S. aureus</i> = 1.3–23.4 mm, <i>E. coli</i> = 0.7–23 mm, isolated from post-operative wounds.	[46]
Euphorbiaceae	<i>Alchornea cordifolia</i> Müll.Arg.				
Fabaceae	<i>Parkia clappertoniana</i> Keay	Fruit	Ethanol	Antimicrobial activity against <i>K. pneumoniae</i> (MIC = 125 µg/mL), <i>E. coli</i> , <i>P. aeruginosa</i> , and <i>C. albicans</i> (MIC = 250 µg/mL).	[37]
Pedaliaceae	<i>Harpagophytum procumbens</i> Burch.			Antibacterial activity against <i>C. acnes</i> (MIC = 31.25 µg/mL), <i>S. aureus</i> and <i>S. epidermidis</i> (MIC = 10 µg/mL).	
Anacardiaceae	<i>Ozoroa sphaerocarpa</i> (Sond.) R.Fern. & A.Fern.	Root bark	Ethanol	Antibacterial activity against <i>C. acnes</i> (MIC = 250 µg/mL).	[47]
Combretaceae	<i>Combretum collinum</i> Fresen.				
Fabaceae	<i>Schotia brachypetala</i> Sond.			Antibacterial activity against <i>C. acnes</i> (MIC = 125 µg/mL).	
Lamiaceae	<i>Salvia barrelieri</i> Etl.	Aerial parts	Ethanol	Antibacterial activity against <i>S. aureus</i> , <i>S. epidermidis</i> , <i>P. aeruginosa</i> , <i>E. faecalis</i> , and <i>E. coli</i> (MIC = 15.1 to 125 µg/mL).	[48]
Euphorbiaceae	<i>Bridelia micrantha</i> (Hochst.) Baill.	Leaves	Methanol	Antibacterial activity against <i>S. pyogenes</i> , <i>C. albicans</i> , <i>E. coli</i> , <i>N. gonorrhoeae</i> and <i>S. typhi</i> (MIC = 1.25 to 2.5 mg/mL).	[35]
Meliaceae	<i>Khaya grandifoliola</i> C.DC.	Stem, bark, root, leaves	Methanol and ethyl acetate	Methanol extract showed antimicrobial activity against <i>S. aureus</i> (MIC = 1–2 mg/mL) and ethyl acetate extract against <i>S. pyogenes</i> (MIC = 0.25 mg/mL).	[49]
Mimosaceae	<i>Entada africana</i> Guill. & Perr.	Leaves, stem	Aqueous	Antibacterial activity against <i>S. aureus</i> and <i>S. pyogenes</i> (MIC = 1.56 mg/mL).	[42]

Abbreviations: *E. coli* = *Escherichia coli*, *C. albicans* = *Candida albicans*, *C. glabrata* = *Candida glabrata*, *P. aeruginosa* = *Pseudomonas aeruginosa*, *S. aureus* = *Staphylococcus aureus*, *S. epidermidis* = *Staphylococcus epidermidis*, *S. pyogenes* = *Streptococcus pyogenes*, *M. furfur* = *Malassezia furfur*, *E. faecalis* = *Enterococcus faecalis*, *L. monocytogenes* = *Listeria monocytogenes*, *N. gonorrhoeae* = *Neisseria gonorrhoeae*.

Table 3. Melanogenesis inhibition / Anti-tyrosinase activity in African plant extracts (2018–2024).

Family Plant	Plant Name	Part of Plant	Extract Type	Outcomes	Control	Reference
Anacardiaceae	<i>Pistacia atlantica</i> Desf.	Leaves	Hydro-methanolic	Anti-tyrosinase (EC ₅₀ = 0.098 mg/mL).	Quercetin 0.010 mg/mL	[45]
	<i>Aloe ferox</i> Mill.			Anti-tyrosinase activity (IC ₅₀ = 138.2 µg/mL).		
	<i>Aloe spectabilis</i> Reynolds			Anti-tyrosinase activity (IC ₅₀ = 78.9 µg/mL).		
	<i>Aloe marlothii</i> A.Berger			Anti-tyrosinase activity (IC ₅₀ = 189.5 µg/mL).		
	<i>Aloe chabaudii</i> Schönland			Anti-tyrosinase activity (IC ₅₀ = 224.2 µg/mL).		
<i>Asphodelaceae</i>	<i>Aloe excelsa</i> A.Berger	Leaves	Methanol	Anti-tyrosinase activity (IC ₅₀ = 244.1 µg/mL).	Kojic acid 87.4 µg/mL	[50]
	<i>Aloe petricola</i> Pole-Evans			Anti-tyrosinase activity (IC ₅₀ = 333.1 µg/mL).		
	<i>Aloe mitriformis</i> Mill.			Anti-tyrosinase activity (IC ₅₀ = 395.9 µg/mL).		
	<i>Aloe candelabrum</i> A.Berger			Anti-tyrosinase activity (IC ₅₀ = 363.7 µg/mL).		
	<i>Rhanterium suaveolens</i> Desf.	Flowers, leaves, stems	Methanol	Flower extract presented higher anti-tyrosinase activity (IC ₅₀ = 61.56 µg/mL) when compared with RSL (IC ₅₀ = 124.13 µg/mL), RSS (IC ₅₀ = 96.72 µg/mL).	Kojic acid 2.24 µg/mL	[51]
Rubiaceae	<i>Nauclea latifolia</i> smith.	Fruits	Methanol and Dichloromethane-methanol fractions	Anti-tyrosinase activity IC ₅₀ for extract = 127.3 µg/mL and fractions (NL-VII, NL-VIII) IC ₅₀ = 233.13, 124.44 µg/mL.	Kojic acid 12.01 µg/mL	[52]
Hypericaceae	<i>Psorospermum aurantiacum</i> Engl.	Stem bark	Methanol methylene chloride extract and fractions: hexane, methylene chloride, ethyl acetate, methanol	Anti-tyrosinase activity for 3-geranyloxyemodinanthrone, lipoxxygenase IC ₅₀ = 65 µg/mL and 35.35 µg/mL, respectively.	Vitamin C 41.85 µg/mL	[53]

Table 3. Cont.

Family Plant	Plant Name	Part of Plant	Extract Type	Outcomes	Control	Reference
Combretaceae	<i>Combretum collinum</i> Fresen.			Anti-tyrosinase activity IC ₅₀ = 47.92 µg/mL.		
Fabaceae	<i>Acacia nilotica</i> (L.) Willd. Delile	Root bark	Ethanol	Anti-tyrosinase activity IC ₅₀ = 12.97 µg/mL.	Kojic acid 1.38 µg/mL	[47]
	<i>Scholtia brachypetala</i> Sond.			Anti-tyrosinase activity IC ₅₀ = 35.07 µg/mL.		
Rubiaceae	<i>Vangueria infausta</i> Burch.			Anti-tyrosinase activity IC ₅₀ = 52.81 µg/mL.		
Asteraceae	<i>Pentzia monodiana</i> Maire	Aerial part	Aceton	Lignanes and flavonoids exhibited anti-tyrosinase activity IC ₅₀ = 45.4 to 97.2 µM.	Kojic acid 6.4 µg/mL	[54]
Euphorbiaceae	<i>Macaranga hurifolia</i> Beille			Strong anti-tyrosinase activity in the stem bark 160.42 mg KAE/g compared to the leaves 159.42 mg KAE/g.		
Malvaceae	<i>Sterculia tragacantha</i> Lindl.	Leaves, stem bark	Methanol	Anti-tyrosinase activity 142.28 mg KAE/g.	-	[55]
Rutaceae	<i>Zanthoxylum gillettii</i> (De Wild.) P.G.Waterman			Anti-tyrosinase activity 128.36 mg KAE/g.		
Fabaceae	<i>Ormocarpum trichocarpum</i> (Taub.) Harms			Tyrosinase inhibition at IC ₅₀ = 2.95 µg/mL.		
	<i>Vachellia karroo</i> (Hayne) Banfi & Galasso	Leaves, stems, roots	Ethanol	Tyrosinase inhibition at IC ₅₀ = 6.84 µg/mL.	Kojic acid 6.45 µg/mL	[56]
Myrsinaceae	<i>Myrsine africana</i> L.			Tyrosinase inhibition at IC ₅₀ = 27.4 µg/mL.		
Crassulaceae	<i>Kalanchoe thyrsiflora</i> Haro.			Tyrosinase inhibition at IC ₅₀ = 14.30 µg/mL.		
Plumbaginaceae	<i>Limonium cercinense</i> Brullo & Erben	Leaves	Ethanol	Anti-tyrosinase activity IC ₅₀ = 3 µg/mL.	Kojic acid 25 µg/mL	[57]
Plumbaginaceae	<i>Limonium boitardii</i> Maire			Anti-tyrosinase activity IC ₅₀ = 5 µg/mL.		

Table 3. Cont.

Family Plant	Plant Name	Part of Plant	Extract Type	Outcomes	Control	Reference
Melanthaceae	<i>Bersania abyssinica</i> Fresen.	Leaves	Aqueous, Methanol, Ethyl acetate	Tyrosinase inhibition 129.43 mg KAE/g in ethyl acetate extracts, methanol and water extracts 48.94 and 83.22 mg KAE/g, respectively.	-	[58]
Scrophulariaceae	<i>Scoparia dulcis</i> L.	leaves		Tyrosinase inhibition 136.47 mg KAE/g in ethyl acetate extracts, methanol and water extracts 144.73, 56.07 mg KAE/g, respectively.	-	
Myrsinaceae	<i>Myrsine africana</i> L.	Shoots	Methanol extract, ether, CHCl ₃ , EtOAc, and n-BuOH fractions	The extract showed tyrosinase inhibition with an IC ₅₀ of 0.12 mg/mL. The isolated compounds rutin and myricetin 3-O- α -L-rhamnopyranoside exhibited IC ₅₀ values of 0.13 $\pm$ 0.003 mM and 0.12 $\pm$ 0.002 mM, respectively.	Kojic acid 0.01 μ g/mL	[59]
Fabaceae	<i>Bauhinia rufescens</i> Lam.	Stem bark	Petroleum ether extract, ether–diethyl ether–CHCl ₃ –EtOAc–MeOH fractions.	The isolated phytosterol showed 57.1% tyrosinase inhibition at a concentration of 0.1 mg/mL.	Kojic acid 85%	[60]
Myricaceae	<i>Morella quercifolia</i> (L.)			Melanin inhibition IC ₅₀ < 6.25 μ g/mL.		
Fabaceae	<i>Serruria furcellata</i> R.Br.			Melanin inhibition IC ₅₀ = 7.13 μ g/mL.		
Anacardiaceae	<i>Searsia antarctica</i> (Willd.)			Melanin inhibition IC ₅₀ = 20.25 μ g/mL.		
Asteraceae	<i>Pentzia. ericoides</i> (L.)	Aerial parts	Methanol	Melanin inhibition IC ₅₀ = 27.67 μ g/mL.	kojic acid < 6.25	[61]
Rhamnaceae	<i>Cryptolepis geifolia</i> (L.)			Melanin inhibition IC ₅₀ = 36.88 μ g/mL.		
Lamiaceae	<i>Tetradenia riparia</i> (Hochst.) Codd			Melanin inhibition IC ₅₀ = 43.88 μ g/mL.		

Table 3. Cont.

Family Plant	Plant Name	Part of Plant	Extract Type	Outcomes	Control	Reference
Proteaceae	<i>Protea cynaroides</i> (L.) L.	Leaves	Methanol extract and n-hexane, DCM, EtOAc, BuOH fractions.	Anti-tyrosinase activity for extract IC ₅₀ = 85.20 µg/mL, 3,4-dihydroxybenzoic acid IC ₅₀ = 0.8776 µg/mL and 3-Hydroxy kojic acid IC ₅₀ = 0.7215 µg/mL.	kojic acid 0.8347 µg/mL	[62]
Sapotaceae	<i>Argania spinosa</i> (L.) Skeels	Fruits	Ethanol	Melanin inhibition 55% at 50 µg/mL.	Arbutin 50%	[63]
Asteraceae	<i>Dicerolhammus rhinocerotis</i> (L.f.) Koek.	Leaves	Methanol and hexane, dichloromethane, ethyl acetate, and butanol fraction.	The ethyl acetate and butanol fractions demonstrated strong anti-tyrosinase activity IC ₅₀ = 11.6 µg/mL and 13.7 µg/mL, respectively, also the isolated compound apigenin IC ₅₀ = 14.58 µM.	kojic acid 17.26 µM	[64]

Assessment of risk of bias: Risk of bias was assessed for all included studies to evaluate the internal validity and methodological quality of the evidence. For in vivo animal studies, we applied the SYRCLE Risk of Bias tool. This tool assesses 10 domains of bias, including selection bias, performance bias, detection bias, attrition bias, and reporting bias. Each domain was judged as having low, high, or unclear risk of bias, based on the methodological information reported in each study. For in vitro studies, a customized checklist based on GIVIMP and CRIS guidelines was used to evaluate criteria such as methodological transparency, control usage, statistical analysis, and data completeness.

3. Results and Discussion

The database search identified 157 articles. Figure 1 presents a flowchart illustrating the study selection process and the number of articles at each stage. The 37 studies analyzed were conducted in African countries, namely South Africa (n = 8), Ghana (n = 6), Morocco (n = 3), Algeria (n = 4), Tunisia (n = 2), Ethiopia (n = 5), Egypt (n = 1), Cameroon (n = 2), Nigeria (n = 4), and Ivory Coast (n = 2). This study reviews the antimicrobial, wound-healing, and Melanogenesis-inhibition activities of 53 plant species from 28 families, with Fabaceae being the most represented family; leaves were the plant structures most frequently used.

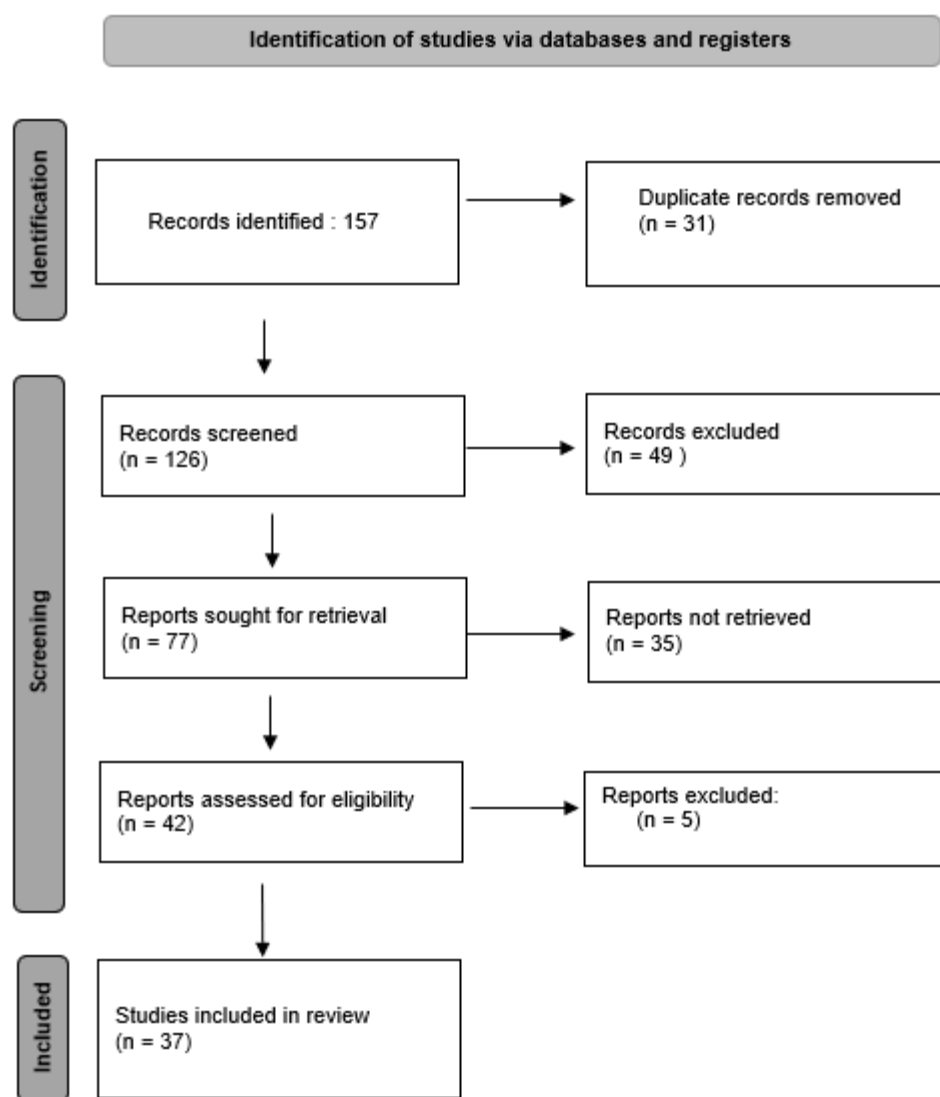


Figure 1. Study flow chart (PRIS).

Among the 37 studies included in this review, 15 involved in vivo experiments and were assessed using the SYRCLE Risk of Bias tool. The overall risk of bias across these studies was moderate to high, with the most frequent limitations being the absence of blinding, unclear or unreported randomization methods, and lack of allocation concealment.

The in vitro studies were evaluated using a customized checklist based on the GIVIMP and CRIS guidelines. Overall, these studies demonstrated a low to moderate risk of bias, particularly due to strong adherence to methodological transparency and the use of appropriate controls. However, common limitations included the absence of blinding of assessors and incomplete statistical reporting.

3.1. Wound Healing Potentia

Medicinal plant extracts exhibited promising efficacy in these areas. Although the studies used various methodologies, all investigated plant extracts demonstrated positive outcomes by promoting angiogenesis, activating NF- κ B, increasing the production of pro-inflammatory cytokines, enhancing iNOS and alpha-1 type-1 collagen expression, stimulating fibroblast proliferation, and demonstrating antioxidant effects [15]. The wound healing studies included in this study evaluated the wound contraction and re-epithelization capabilities of plant extracts [28–30,32], their effects on keratinocytes and fibroblast proliferation and migration [31,36], and their antimicrobial activity [32,35,37,42].

Emilia coccinea, *Entada africana*, and *Trichilia dregeana* demonstrated complete wound contraction (100%) by day 16 [32,41,42]. This accelerated healing is likely to enhance fibroblast proliferation, collagen deposition, and antioxidant activity. Effective wound repair depends on the balance between reactive oxygen species (ROS) and antioxidant defenses [65]. While physiological levels of ROS play a signal role in healing, excessive ROS can damage cellular proteins and DNA, prolong inflammation, and impair tissue regeneration [65,66]. Additionally, oxidative stress upregulates matrix metalloproteinases (MMPs), especially collagenases, which degrade the extracellular matrix and delay healing [67].

The potent wound-healing effects of *T. dregeana* and *E. coccinea* have been linked to their high content of phenolic, flavonoid, alkaloid, tannin, and saponin compounds, which exhibit strong antioxidant activity [68]. Toxicological evaluation revealed that *E. coccinea* extract was non-irritating to both the skin and eyes [32]. In comparison, *Calendula officinalis*, a well-known European medicinal plant, also promotes wound healing by modulating oxidative stress and enhancing collagen synthesis [69]. However, it has been associated with allergic skin reactions [70]. Similarly, *Curcuma longa* (turmeric), widely used in Asian traditional medicine, enhances fibroblast proliferation and downregulates MMPs through its active component curcumin [71]. Nevertheless, high topical concentrations of curcumin may result in local toxicity, and its poor solubility, low bioavailability, and rapid metabolism pose challenges for clinical application [72].

Caralluma europaea extract (Apocynaceae) showed significant wound retraction in skin burns in rats, with the greatest effect (98.2%) observed on the 21st day [29]. Additionally, the chemical composition of the extract was analyzed, revealing the presence of lipids such as linoleic acid and vitamin D3. Previous research has shown that fatty acids, including those found in the extract, can accelerate wound healing by promoting angiogenesis, cellular growth, and the production of an extracellular matrix [73]. In a comparable study by Khyade [74], *Wrightia tinctoria* (Apocynaceae) extract, a plant native to South Asia, showed 99.2% wound closure by day 16. This strong healing effect is largely attributed to its high triterpenoid content, amyryns, and lupeol.

An in-vitro study by Aly [36] of *Tamarindus indica*'s n-hexane extracts using the wound scratch assay demonstrated enhanced fibroblast migration and promoted wound healing at 10 μ g/mL. Attah [75] reported that the wound-healing potential of *T. indica* fruit paste in

adult rabbits accelerated wound closure and significantly improved epithelial cell migration and re-epithelialization. This might be attributed to the presence of chemical components such as terpenoids, sterols, and fatty acids, specifically, compounds like lupeol, lupeol acetate, linolenic acid, squalene, γ -sitosterol, linolenic acid, and squalene. γ -sitosterol was shown to inhibit MMP-1, reduce collagen breakdown, promote collagen synthesis, and promote keratinocyte migration [76,77]. In previous studies, lupeol and lupeol acetate were reported to enhance collagen production, fibroblast proliferation, and angiogenesis [78,79]. Another study on hyperglycaemic rats confirmed the wound-healing potential of lupeol in diabetic conditions [80]. Linolenic acid and squalene contribute to wound healing through antioxidative, anti-inflammatory, and skin barrier restoration properties [81].

Aqueous *Lawsonia inermis* extract showed significant wound retraction (100%) in excision wound models in Swiss albino mice, more than Silver sulphadiazine (90%) on day 20 [40]. A similar study [39] reported that an aqueous extract of *L. inermis* produced wound contraction (85.97%) in burn wounds in mice, which might be attributable to phenolic compound contents, flavonoids, and tannins [40]. Flavonoids enhance wound healing through their antibacterial, astringent, and anti-inflammatory properties, supporting angiogenesis and modulating cytokines [82,83]. Tannins promote healing by improving tissue regeneration, reducing edema, and stimulating fibroblast and keratinocyte proliferation. Their antioxidant and anti-inflammatory effects further aid wound contraction and angiogenesis [39,84,85]. Additionally, a study conducted in India found that henna-based ointments applied in excision wound models in rats achieved wound contraction rates of 85.9% to 98.5% between days 16 and 20 [86]. These highlight the wound-healing potential of *L. inermis* in dermatological applications.

Antimicrobial Activity in Wound Healing

Wound infection is one of the factors that contribute to chronic non-healing wounds [87]. Most wounds are susceptible to colonization by microorganisms such as *Streptococcus pyogenes* and *Staphylococcus aureus*, whose presence triggers a series of inflammatory responses [88]. These responses can prolong the inflammatory phase of wound healing, degrade growth factors, and delay epithelialization [89].

Kuma [37] showed that the extract from *Parkia clappertoniana* fruit husk exhibited gram-selective bacteriostatic and antifungal activity against *Pseudomonas aeruginosa*, *Escherichia coli*, *Candida albicans*, and *Klebsiella pneumoniae* from excisional wounds in rats. The extract enhanced wound contraction and promoted re-epithelialization compared with silver sulfadiazine. Histological assessment revealed thicker epithelial tissues, increased collagen deposition in the dermis, improved granulation, and reduced inflammatory infiltration. Phytochemical screening confirmed the presence of catechin and quercetin in the extract, suggesting potential wound-healing properties and antimicrobial activity. Research by Chaniad [88] and Moulaoui [90] corroborated that catechin and quercetin possess wound-healing, antioxidant, anti-inflammatory, and antimicrobial effects and promote collagen synthesis. Additionally, PCFHE did not cause any adverse dermatological reactions in the treated rats.

In a study by Baidoo [42], the methanol extract of the stem bark of *Entada africana* exhibited moderate broad-spectrum antimicrobial activity against *S. pyogenes* and *S. aureus*, with an MIC of 1.56 mg/mL. In comparison, the study by Kwaji [91] reported the inhibitory effect of stem bark *E. africana* methanol against *S. aureus* at an MIC = 6.25 mg/mL. These antimicrobial effects are likely due to the presence of bioactive compounds such as tannins, coumarins, flavonoids, and triterpenoid polyphenols, which are known for their antimicrobial and antioxidant properties [92,93]. The difference in MIC values between

the two studies could potentially be attributed to the plant's age, geographic range, and post-harvest handling, drying, and storage techniques.

Ekom [35] reported that the methanolic leaf extracts of *Bridelia micrantha* demonstrated significant inhibitory effects against *S. pyogenes*, *C. albicans*, *E. coli*, *Neisseria gonorrhoeae*, and *Salmonella typhi*. Additionally, the extracts improved wound contraction, re-epithelialization, and granulation tissue formation. Histological studies confirmed a reduction in wound area and collagen content. Similar findings by Douglas [94] found that methanol and ethyl acetate extracts of *B. micrantha* inhibited *S. aureus* and *S. typhi*. The phytochemicals present in the extract, including flavonoids and terpenoids, saponins, tannins, alkaloids, glycosides, steroids, and coumarin, could be responsible for its astringent and antimicrobial properties. These compounds are also reported to promote wound healing, assist in wound contraction, and accelerate epithelialization [95,96].

3.2. Antimicrobial Activity

In recent years, the rise of antimicrobial-resistant pathogens has driven increased interest in natural therapies as promising alternatives for managing infections. Current research is focused on identifying plant-based antimicrobial agents that offer broad-spectrum activity while minimizing toxic side effects.

Among the plants evaluated, *Harpagophytum procumbens* exhibited the most potent antibacterial activity, with an MIC of 31.25 µg/mL against *Cutibacterium acnes*, *S. aureus*, and *S. epidermidis* MIC = 10 µg/mL [47]. However, due to its reported anti-proliferative effects on human keratinocyte (HaCaT) cells, the extensive topical use of *H. procumbens* extract should be approached with caution [47]. This finding is supported by Weckesser [97], who reported that aqueous extracts of *H. procumbens* demonstrated strong activity against *S. aureus* (including methicillin-resistant strains), *S. epidermidis* (MIC = 10 µg/mL), and a *C. acnes* isolate (FR 024/12-10) with an MIC of 100 µg/mL. Similarly, a study by Abd Al-Kubaisy [98] in Iraq found that methanolic seed extracts of *H. procumbens* exhibited broad-spectrum antimicrobial activity, with inhibition zones ranging from 10 to 22 mm against both gram-positive and gram-negative bacteria (*E. coli*, *P. aeruginosa*, *S. aureus*, *S. pyogenes*) and fungi (*C. albicans*, *C. tropicalis*, *C. parapsilosis*). The strong antimicrobial effect across studies is largely attributed to the presence of bioactive compounds such as tannins, polyphenols, and flavonoids, which act by binding to extracellular and soluble proteins in bacterial cell walls, disrupting membrane function [99], and inhibiting microbial enzymes essential for survival and replication [100].

Benmahieddine [45] reported that *Pistacia atlantica* leaf-bud extract demonstrated strong antimicrobial activity against *S. aureus* (MIC = 78.125 µg/mL), *L. monocytogenes*, and *C. albicans* (MIC = 39 µg/mL). These findings are consistent with Rigane [101], who reported similar activity from ethanolic and aqueous extracts of *P. atlantica* against both gram-positive and gram-negative bacteria. Likewise, hydro-alcoholic extracts tested in another study by Dalvand in Iran [102] showed sensitivity against *B. cereus*, *S. aureus*, *E. coli*, and *P. aeruginosa* (MIC = 16 to 64 mg/mL). The antimicrobial and antifungal properties of *P. atlantica* are largely attributed to its high content of bioactive phytochemicals such as α -pinene, D-limonene, phenols, and flavonoids. These compounds disrupt microbial cell membranes, bind to proteins within the bacterial wall, interfere with enzyme activity, and induce oxidative stress in microbial cells. α -Pinene and D-limonene, in particular, have been shown to increase membrane permeability, leading to leakage of cellular contents and eventual cell death [103].

The ethanol extract of *Combretum collinum* demonstrated moderate antibacterial activity, with an MIC of 250 µg/mL [47]. This finding aligns with results from Cock and Van Vuuren [104], who reported MICs of 330 and 317 µg/mL for *S. aureus* and *S. epidermidis*, respec-

tively, using aqueous and methanolic leaf extracts. Similarly, a study by Marquardt [105] in Benin confirmed the effectiveness of *C. collinum* ethanolic extracts against *S. epidermidis* (MIC = 275 µg/mL) and methicillin-resistant *S. aureus* (MRSA, MIC = 285.5 µg/mL). The plant's activity is likely linked to its polyphenol-rich profile, particularly flavonoids such as myricetin. These compounds can disrupt bacterial membranes, interfere with proton gradients and ion balance, and inhibit key virulence factors like biofilm formation [106,107].

The methanol extract and ethyl acetate extracts of *Khaya grandifoliola* demonstrated inhibitory activity against *S. aureus*, with an MIC of 1 mg/mL [49]. Additionally, it showed inhibition against *S. pyogenes*, with MIC values ranging from 0.25 to 2 mg/mL. This inhibition could play an integral role in promoting wound healing. By contrast, Stephen [108] reported that the ethanol stem bark extract of *K. grandifoliola* inhibited the growth of *S. aureus* with an MIC of 0.4 mg/mL. The difference in MIC values between the two studies could potentially be attributed to variations in the location and period of plant harvesting.

3.3. Melanogenesis Inhibition

Melanin, produced by melanocytes through melanogenesis, plays a key role in skin and hair pigmentation and provides photoprotection against UV-induced skin damage [109]. Overproduction of melanin is linked to various pigmentary disorders such as melasma and lentigines. Tyrosinase, a critical enzyme in this process, catalyzes the rate-limiting steps of melanin synthesis. It catalyzes the hydroxylation of L-tyrosine to 3,4-dihydroxyphenylalanine (L-DOPA) and the oxidation of L-DOPA to dopaquinone [110].

Ethanol extract of *O. trichocarpum* and *Vachellia karroo* (Fabaceae) showed tyrosinase inhibitory activity with IC₅₀ 2.95 µg/mL and 6.84 µg/mL, respectively [56]. Similarly, Lall [47] demonstrated significant effects on tyrosinase inhibition for extracts of *Acacia nilotica* and *Schotia brachypetala*, both belonging to the Fabaceae family, with IC₅₀ of 12.97 ± 1.07 µg/mL and 35.07 ± 0.71 µg/mL, respectively. Various factors can influence the level of active compounds in plant extracts, thereby affecting their quality and consistency, including the plant's age, geographic range, genetic variety, seasonal variations, and post-harvest handling, drying, and storage techniques [111]. The tyrosinase inhibition activity observed in Fabaceae extracts is likely due to their high content of phenolic flavonoid compounds [112]. These compounds can interfere with melanin biosynthesis by disrupting copper homeostasis, binding to the active site of tyrosinase, and preventing enzymatic activity [112]. A previous study reported tyrosinase inhibition by the Asian plant *Sophora japonica* (Fabaceae), which contains flavonoids, such as rutin and quercetin [113]. Flavonoids contain a phenol structural group that may be a structural analogue to the L-tyrosine substrate [114].

Limonium cercinense and *Limonium boitardii* extracts showed tyrosinase inhibition, with an IC₅₀ of 3 µg/mL and of 5 µg/mL, respectively, compared to kojic acid (IC₅₀ = 25 µg/mL) [57]. These findings align with results from Lee [115], where *L. tetragonum* extracts exhibited a significant anti-tyrosinase effect. *L. morisianum* Arrigoni extract (an endemic to Sardinia) was reported to inhibit tyrosinase activity by 56% at 50 µg/mL [116]. This potent effect is attributed to its rich phenolic profile, myricetin, myricetin 3-O-β-D-galactopyranoside, rutin, and quercetin. These compounds inhibit tyrosinase by binding both free enzyme and the tyrosinase–L-DOPA complex [117]. Myricetin 3-O-β-D-galactopyranoside specifically reduces cellular tyrosinase activity and suppresses TRP-1 and TRP-2 expression more effectively than kojic acid [118]. Quercetin acts as a reversible competitive inhibitor with superior efficacy to kojic acid, likely due to its hydroxyl groups forming hydrogen bonds with tyrosinase active site residues [117].

The ethanol extract of *Myrsine africana* leaves demonstrated strong tyrosinase inhibition, with an IC₅₀ of 27.4 µg/mL [56]. This aligns with findings by Momtaz [119], who reported an IC₅₀ of 20 µg/mL for a methanol extract derived from the aerial parts and

bark of the same species. Similarly, Kishore [59] found that a methanol extract from the shoots of *M. africana* had an IC₅₀ of 120 µg/mL. In the same study, isolated flavonoid compounds quercetin 3-O-α-L-rhamnopyranoside and myricetin 3-O-α-L-rhamnopyranoside exhibited much stronger tyrosinase inhibition, with IC₅₀ values of 0.13 ± 0.003 mM and 0.15 ± 0.003 mM, respectively. These results are consistent with previous reports showing that quercetin and rutin inhibit tyrosinase activity, with IC₅₀ values of 0.13 mM and 0.52 ± 0.002 mM, respectively [118,120]. The strong inhibitory activity of these flavonoids is likely due to their ability to chelate copper ions at the enzyme's active site and suppress L-DOPA oxidation, thereby interfering with melanin biosynthesis [113].

Sadeer [55] reported that *Macaranga hurifolia* showed higher anti-tyrosinase activity in the stem bark (160.42 mg KAE/g) compared to the leaves (159.42 mg KAE/g). *Rhanterium suaveolens* flower extract presented higher anti-tyrosinase activity (IC₅₀ 61.56 µg/mL) when compared with the leaves, stem, and kojic acid (124.13 µg/mL, 96.72 µg/mL, and 2.24 µg/mL, respectively) [51]. These findings underscore the potential of plant extracts as effective inhibitors of tyrosinase activity, with variations depending on solvent type, extraction method, plant parts, and species.

4. Limitations

The studies included in this review exhibited substantial variability in methodology, plant parts used, extraction techniques, and outcome measurements, making direct comparisons and firm conclusions challenging. Additionally, the absence of standardized dosages and inconsistent reporting of statistical outcomes further limited data synthesis. Future research should adopt standardized protocols and clearly report statistical results. Long-term safety evaluations and the development of effective, stable formulations are also essential to advance these promising medicinal plants toward clinical and commercial dermatological applications.

5. Conclusions

This study highlights the extensive therapeutic potential of African medicinal plants in treating a variety of dermatological conditions. Notably, these natural resources demonstrate significant efficacy in managing skin infections, promoting wound healing, and addressing skin pigmentation. The phenols, flavonoids, steroids, vitamins, and myriad of other active compounds present in these plant extracts exhibit powerful antimicrobial, wound-healing, anti-inflammatory, and antioxidant activities, making them candidates for treating hyperpigmentation and other skin disorders.

Furthermore, integrating African medicinal plants into contemporary dermatological practices promises to revolutionize skin health management. This approach promotes a holistic, sustainable, and highly effective paradigm in dermatology, potentially reducing the dependency on synthetic drugs and highlighting the importance of natural alternatives in medical treatments.

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