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Review

A Review on the Ethnomedicinal Plants Used in Zimbabwe for the Treatment and Management of Skin Conditions: Perspectives on Pharmacological and Toxicological Evaluation

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Abstract

Medicinal plants remain central to healthcare in Africa, where up to 80% of the population relies on traditional remedies to manage a range of health conditions, including skin ailments. In Zimbabwe, the country's rich biodiversity and favourable agroecological zones support a

diverse range of ethnomedicinal plants. However, much of the knowledge surrounding these plants remains dispersed and scientifically under-evaluated. This review consolidates evidence from ethnobotanical surveys, peer-reviewed research, and grey literature to identify 93 plant species used in Zimbabwe for the treatment of 21 skin-related conditions, ranging from wounds and ulcers to measles and fungal infections. Most remedies are applied topically, often in powder or paste form, with leaves and roots cited as the most commonly used plant parts. Notably, plant species from the Fabaceae, Asteraceae, and Verbenaceae families featured most frequently. Pharmacological assessments revealed that many of these plants exhibit antimicrobial, anti-inflammatory, and antioxidant properties. Yet, safety data is uneven; 40.9% of species had confirmed low toxicity, 8.6% were associated with high toxicological risks, and the remainder lacked sufficient toxicological profiling. By compiling and critically analyzing this knowledge, the study bridges gaps between traditional practice and biomedical research. It highlights species with potential for further pharmacological validation and underscores the role of indigenous knowledge in informing future dermatological drug discovery. Ultimately, this work contributes to the broader literature on integrative medicine by mapping out a culturally and scientifically relevant repository of medicinal plants used in Zimbabwe.

Keywords
Ethnobotanical; ethnomedicine; pharmacological; toxicology; traditional plants; skin; wounds; Zimbabwe

1. Introduction

Traditional medicine is described by the World Organization as the sum of the knowledge, skills, and practices based on the theories, beliefs, and experiences indigenous to different cultures, whether explicable or not, used in the maintenance of health and the prevention, diagnosis, improvement, or treatment of physical and mental illness [1]. Traditional medicines form an integral part of the cultural heritage in Africa, with approximately 80% of the population on the continent relying on these remedies for their healthcare needs [2]. Modern technology applied to traditional knowledge has played a significant role in deriving at least 40% of all modern medicines directly or indirectly from medicinal plants [3]. Throughout history, traditional medicines have consistently held a crucial position in global healthcare, persistently utilised for addressing a wide range of conditions and ailments.

The skin, which consists of multiple layers such as the epidermis, dermis, and hypodermis, is the body's largest organ. As an organ, it provides protection and acts as a physical barrier against infections [4]. Skin diseases affect about 1.8 billion people in the world [1]. Skin diseases are common in Africa, and the prevalence varies by region and population. Some common skin diseases in Africa include scabies, eczema, acne, and fungal infections [5]. Skin conditions such as cancers, eczema, herpes infection, fungal infection, anti-ageing concerns, itching, insect bites, pemphigus vulgaris, trauma, psoriasis, athlete's foot infections, rashes, skin pigmentation, acne, and primary and minor wound infections are the most prevalent skin disorders [6]. Skin diseases affect

individuals of all age groups, but children are particularly vulnerable due to the thinness and delicacy of their skin [7]. The utilisation of natural plant-based medicines for treating skin disorders is prevalent in Zimbabwe and worldwide [2]. This approach is favoured due to several advantages, such as minimal side effects, cost-effectiveness, and longstanding acceptance of its use. Plants contain phytochemical substances that are employed in the treatment of skin disorders.

Phytochemicals consist of primary and secondary metabolites. Secondary metabolites have long been recognised for their bioactivity against various diseases. Several secondary metabolites, such as mangiferin, lutein, curcumin, resveratrol, embelin, naringenin, quercetin, lycopene, gingerol, and apigenin, are utilised for the treatment of skin disorders [4]. Herbal remedies like tea tree oil, Aloe vera, and green tea extract have been used to reduce inflammation and control acne breakouts. Numerous studies have examined medicinal plant extracts for bioactive properties like antioxidants, anti-inflammatory effects, and antimicrobial activities in skin conditions, to validate their efficacy [8]. Traditional healers in Zimbabwe use a plethora of plant species for dermatological issues. A survey in south-central Zimbabwe identified 93 medicinal plant species from 41 families used to treat 18 different categories of diseases, including skin infections. Trees and shrubs are predominantly used, with leaves being the most common plant part applied. Common skin conditions treated include abscesses, acne, burns, boils, ringworm, rashes, shingles, sores, wounds, and warts [9].

The Fabaceae family is notably significant, with about 101 species used traditionally in Zimbabwe for various medicinal purposes, including skin-related issues. For example, species like Indigofera and Senna are used for conditions like wounds and sores [9]. Plants like *Hypoxis hemerocallidea* and *Helichrysum paronychioides* have high cultural importance in treating skin diseases [10]. These plants are often used in the form of roots, whole plants, or leaves, prepared through concoctions, macerations, or decoctions.

Aloe excelsa, a plant that is indigenous to Zimbabwe and some parts of Southern Africa, is very effective against skin diseases like wounds. *Aloe ecelsa* is known for its anti-inflammatory, skin protection, anti-bacterial, anti-viral, antiseptic, and wound healing properties [11]. Although traditional medicine is gaining greater acceptance in Zimbabwe, the valuable indigenous knowledge concerning traditional remedies remains inadequately documented. Proper documentation of the conventional use of medicinal plants in Zimbabwe for treating skin diseases is crucial. Indigenous Knowledge Systems (IKS) documentation and scientific validation play a vital role in safeguarding indigenous knowledge and cultural traditions. IKS offers alternative, complementary, and more accessible treatment options. The ethnopharmacological approach contributes to biodiversity preservation while serving as a foundation for discovering innovative pharmaceuticals and therapeutic strategies based on medicinal plant knowledge.

2. Materials and Methods

2.1 Protocol Development

The Joanna Briggs Institute (JBI) scoping review methodology [12] guided the study design. It followed the Preferred Reporting Items for Systematic Reviews and Meta-Analysis Extension for Scoping Reviews (PRISMA-ScR) [13, 14]. Here, three members of the research team (CM, AM, and EN) reviewed literature from databases, registers, and websites, as well as books (see Figure 1). The current policy prohibits the registration of scoping reviews on PROSPERO, which is the International

Prospective Register of Systematic Reviews. Therefore, this review was not eligible for registration. However, the protocol is accessible from the authors upon request.

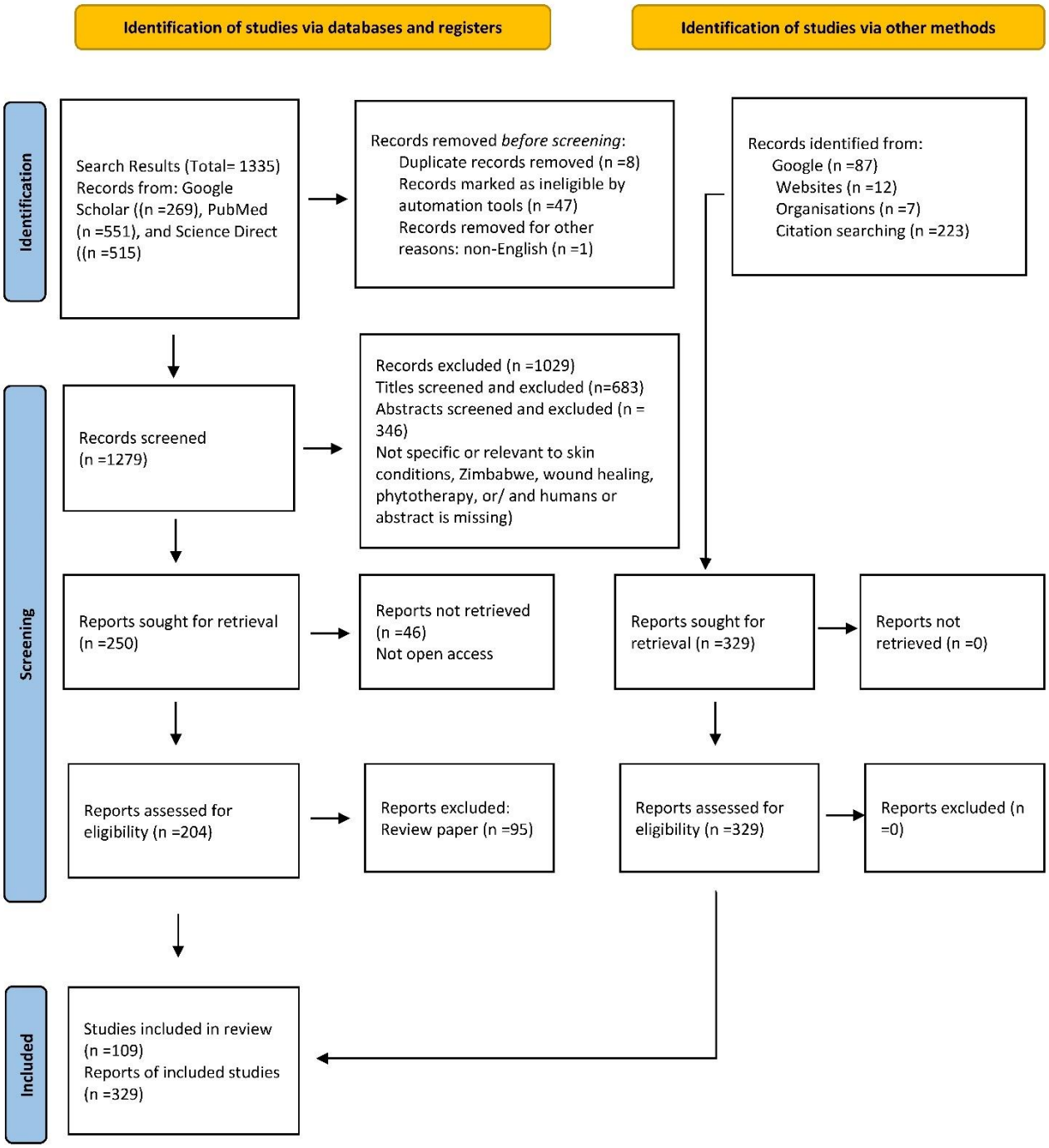

Figure 1 Flowchart for the review of literature [14].

2.2 Identifying the Research Question

The study was guided by the research question: What is the pharmacology and toxicology of medicinal plants traditionally used in Zimbabwe for the management of skin conditions?

2.3 Information Sources

Electronic databases such as Science Direct, PubMed, and Google Scholar were mined for literature on medicinal plants used for the treatment of skin conditions in Zimbabwe. The systematic literature search was done using key terms as shown in the Table S1. Bibliographies of cited studies were also searched, and Google, websites, and organisations such as university libraries were used for unpublished data or grey literature. Three co-authors then screened titles and abstracts and checked full-text articles for eligibility. The ethnobotanical survey was done in the form of interviews and questionnaires with the traditional herbal practitioners.

2.4 Study Selection

Records identified through the search strategy were downloaded as BibTeX files are imported into Zotero. This was followed by the removal of duplicate articles. A CSV file with article data was then exported for records screening. The titles and abstracts of the downloaded articles were thus independently screened by three researchers (CM, AMM, EN) using pre-defined inclusion and exclusion criteria. Where all three researchers agreed, studies were included, while consensus was used to settle disparities. Moreover, the full-text review was completed by the three researchers (CM, AM, EN). In case of uncertainty regarding the eligibility of an article, consensus was also used as a resolution among the three researchers.

2.5 Inclusion Criteria

Peer-reviewed journal articles included in this study covered herbal remedies used for skin conditions with a focus on Zimbabwe. Studies published in English addressing phytochemistry, pharmacology, and toxicology of medicinal plants were included. Articles published between the 1st of January 1990, and the 17th of December 2021, were included in this scoping review. Each paper was to be original research or a protocol.

2.6 Exclusion Criteria

This scoping review excluded studies on veterinary herbal remedies, research involving non-Zimbabwean populations, and records not related to wound healing or skin conditions. Additionally, studies with unavailable full texts, those focusing on unrelated diseases, and unpublished works such as theses and dissertations were omitted. Scoping, systematic, and narrative reviews, as well as studies with insufficient or inconclusive data for analysis, were also excluded.

2.7 Data Charting Process

Relevant variables were extracted using a developed data-charting form. The charted variables were the literature characteristics (family, plant name, growth habit, ethnomedicinal use(s), and parts used as well as distribution), pharmacological activities, and toxicological profiles of each plant.

2.8 Data Analysis

The PRISMA-ScR checklist was used to report the results of the scoping review. A data extraction framework developed by the researchers (EN, CM) was then employed for a deductive analysis.

Details generated from the study were the forms and routes of administration of the traditional medicines for the management of skin diseases. A descriptive analysis highlighting the plant families and plant parts used for making herbal medicines, the forms in which the traditional remedies are produced, the family of plants used for the traditional remedy, and the skin conditions the conventional treatments are made to prevent or cure was conducted. A compilation of the names of the plant families studied was also done, and the findings were presented in tables, graphs, and charts.

2.9 Synthesis

The quality or methodology of bias adopted by the included articles was not evaluated in this review [15]. This is so because scoping reviews are not intended to produce a critically appraised and synthesised answer to a specific question. Instead, they merely aim at giving an overview or map of all the evidence. Accordingly, it was not necessary to assess the methodological limitations or bias of evidence included in this scoping review [16].

3. Results and Discussion

3.1 Literature Search

Our search identified 1335 records, which were downloaded and imported into Zotero. About 8 Duplicates and 48 ineligible studies were then removed before screening of records. A comma-separated values (CSV) file was generated for analysis after exporting library data from Zotero. Of the remaining 1279 records, screened titles (n = 683) and abstracts (n = 346) were excluded because they were not specific or relevant to skin conditions or Zimbabwe. Of the 250 reports that were sought for retrieval, 46 could not be retrieved as they were not open source. The remaining 204 studies had 95 review papers, which were then excluded, leaving 109 reports to be included in this scoping review. The authors also considered grey literature from organisations, websites, Google search, and retrieved referenced citations (Total 329 reports) for data on the pharmacology and toxicology profile of medicinal plants used in Zimbabwe for the management of skin conditions. Thus, a total of 438 articles were included in this scoping review. Figure 1 shows the flow diagram of the records screening process.

3.2 Ethnobotanical Surveys of Medicinal Plants Used in Zimbabwe for Treating and Managing Skin Conditions

Ethnobotanical surveys play a crucial role as preliminary screening tools in the exploration of the pharmacological potential of plants. We have identified that Zimbabwe utilises a minimum of 93 plant families for the treatment of skin diseases. This indicates that Zimbabwe has a vast repository of medicinal plants for skin disorders. Bitew [17] conducted a review that identified similar plant species used for treating wounds and skin conditions, including plants found in Ethiopia: *Hypoestes forskalei*, *Solanum incanum,* and *Ziziphus mucronata*. Several other plants have been highlighted by Mabona and Van Vuuren [18] in a review on medicinal plants used for the treatment of skin diseases in Southern Africa.

The different plant families that are mainstream in the treatment and management of skin infections in Zimbabwe are revealed in Figure 2. The Fabaceae, Asteraceae, and Verbenaceae

families contain the majority of the medicinal plants that have been used traditionally in Zimbabwe to treat and manage skin conditions. This could be attributed to the greater prevalence and higher number of plant species belonging to those families within the flora of Zimbabwe. From the collected data, the Fabaceae family stands out as the most diverse and abundant plant family in the country, hosting a significant number of prevalent species. Fabaceae is a family of plants that are commonly found in the country as trees or shrubs, including common species such as *Bobgunnia madagascariensis and Pterocarpus angolensis.*

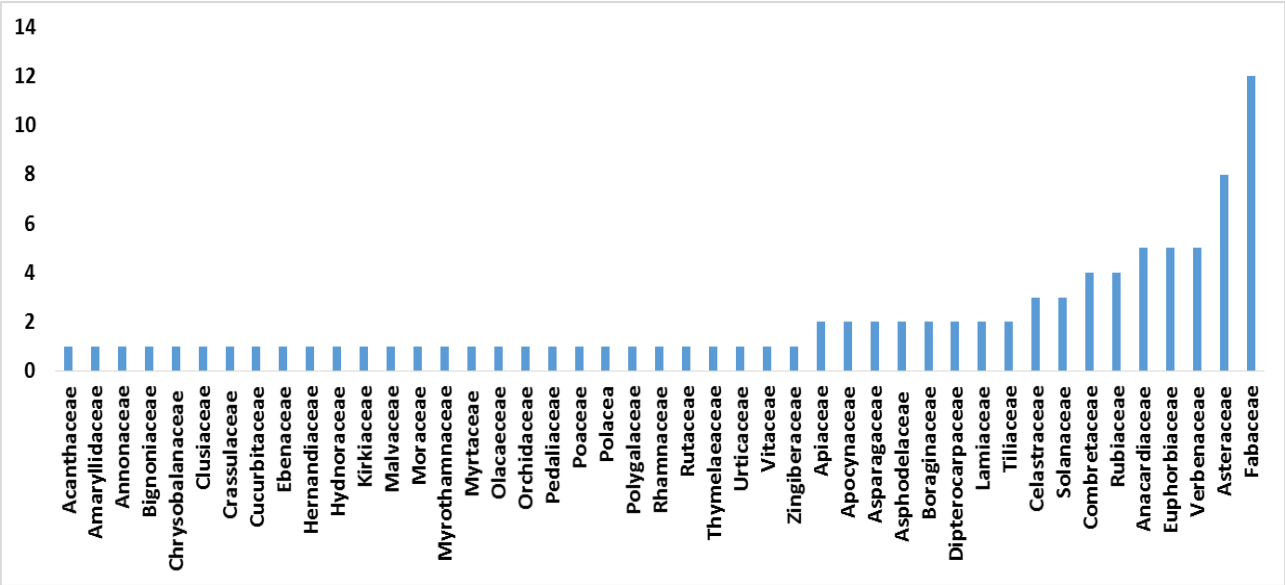

Figure 2 Families of medicinal plant species used to treat and manage skin conditions in Zimbabwe.

3.3 Plant Parts Used of Medicinal Plants Used in Zimbabwe for Treating and Managing Skin Conditions

Plant roots are the most commonly used part for the treatment of skin diseases. Although the utilisation of roots for medicinal purposes is the least environmentally sustainable, it remains one of the most preferred sources of medicine. Plant leaves closely follow, maybe as a result of their easy availability, accessibility, convenience in their preparation, and efficacy of their phytoconstituents. However, the primary plant parts utilised for skin treatment are the roots, leaves, and bark. However, with some herbs, a complete plant, fruit, bark, stem, or any other part of the plant is used for the treatment of skin diseases [19]. Based on the data presented in Figure 3, it is evident that there are multiple plant part options available for the treatment of specific skin diseases.

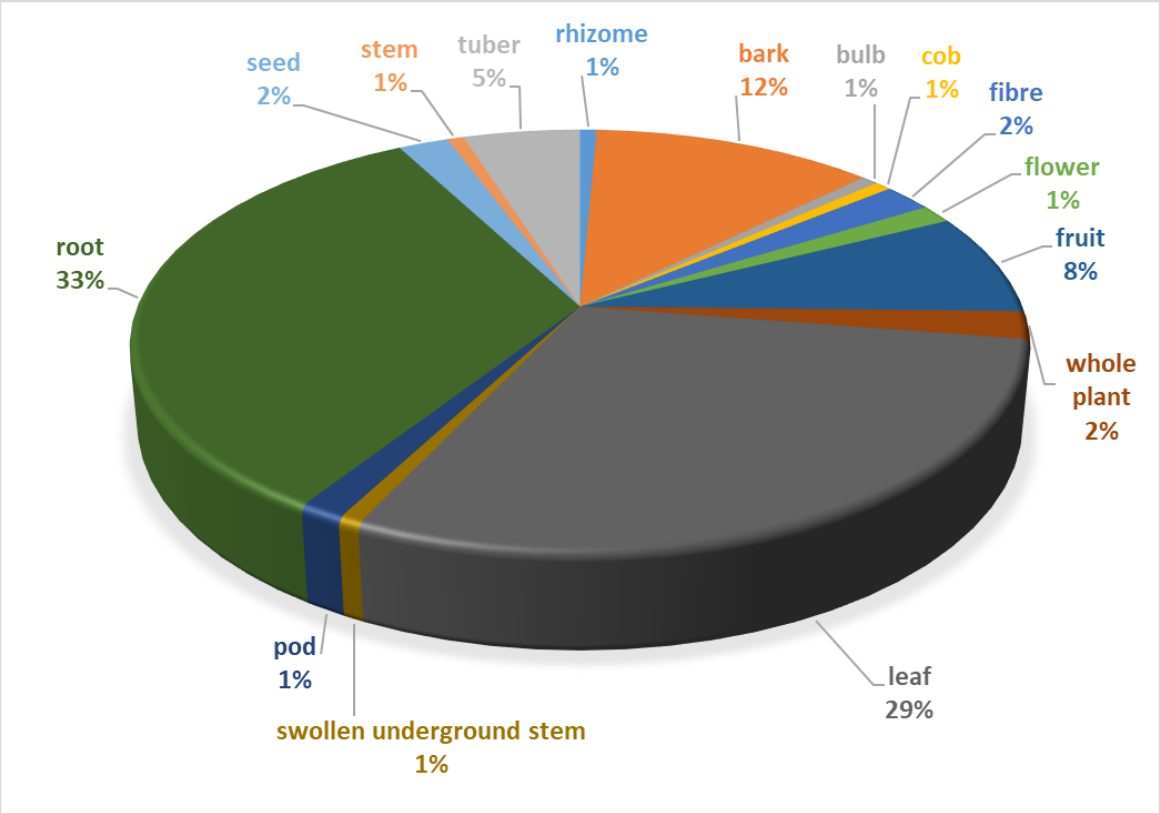

Figure 3 Plant parts used for medicinal preparations used for the management of skin conditions in Zimbabwe.

3.4 Mode of Preparation and Administration of Medicinal Plants Traditionally Used in Zimbabwe for Treating and Managing Skin Conditions

It is reported that southern Africans have traditionally relied on several plants for wound healing [20, 21]. Roots, stems, leaves, and bark are the most commonly used parts of plants for preparing infusions and concoctions. As an example, *Boophone disticha*, a hallucinogenic plant widely distributed in South Africa and Zimbabwe, was reported to be effective in treating wounds after circumcision in males [21]. There have been records of *Ximenia caffra* being used to treat wounds. *X. caffra* leaves were reportedly used topically for wound treatment [22].

Different methods of herbal preparations and applications are shown in Table 1 and Figure 4. The various formulations utilized by local individuals for preparing medicinal plants are powder and soot. Fresh or dried plant materials are used. The most common method of treatment is the use of herbal powder, which is prepared by grinding dried leaves, roots, or bark. The herbal powder is applied topically to the wound or ulcer. Herbal infusions are essentially herbal teas consumed for their antibiotic or analgesic properties. Decoctions are prepared by heating a specific quantity of herbs with water and consumed orally or used to bathe. Decoctions are typically utilized for tougher plant materials, including roots, bark, and seeds. Based on the gathered data, some herbs are also used in the form of soup or ash to treat skin conditions. The resulting liquid can be employed to cleanse wounds, serve as an antiseptic, or be applied to skin rashes. This method is straightforward to prepare, making it one of the most commonly used formulations. Plant soup and soot are the least frequently used for managing skin diseases.

Table 1 Medicinal plants used in Zimbabwe for the treatment and management of skin conditions.

Family	Scientific name	Vernacular name and other names	Ethnomedicinal use(s) and parts used	References
Malvaceae	*Abutilon angulatum* (Guill. & Perr.) Mast. Var *angulatum*	Elephant's ear, Fluted abutilon (English)	Burns: Root powder applied to the burns.	[23]
Euphorbiaceae	*Acalypha brachiata* C. Krauss	Chitambura (Shona) Ubukubelo, Umsekezelo (Ndebele) Heart-leaved Brooms and Brushes (English)	Wounds: Root ground into powder and applied to wounds.	[24]
Fabaceae	*Albizia anthelmintica* (A. Rich.) Brongn.	Munanzwa (Shona) Worm-cure albizia (English)	Wounds: Bark juice applied to sores.	[23]
Apiaceae	*Alepidea amatymbica* Eckl. & Zeyh.	Katazo (Shona)	Wounds	[25]
Asphodelaceae	*Aloe barbadensis* Miller	Gavakava (Shona)	Widely used for external treatment of minor wounds and inflammatory skin disorders: Leaves Skin rashes - Sap.	[26, 27]
Asphodelaceae	*Aloe spp.*	Gavakava (Shona) Icwna (Ndebele)	Wounds: Leaves' juice rubbed on wounds, rashes, irritant skin, and burns.	[23, 28]

Annonaceae	*Annona stenophylla* Engl. & Diels subsp. *Nana* (Exell) N. Robson	Muroro (Shona) Ububese (Ndebele) Dwarf custard-apple (English)	Boils: Root paste warmed and applied to boils.	[23, 29]
Asparagaeae	*Asparagus africanus* Lam	Rukato (Shona) Bush asparagus (English)	Wounds: Roots and leaves.	[24]
Asteraceae	*Bidens pilosa* L	Tsine (Shona) Black-jack (English)	Wounds: Leaves	[27]
Fabaceae	*Bobgunnia madagascariensis* (Desv.) J.H. Kirkbr. & Wiersam	Mucherekese, Mukosho (Shona) Umketsheketshe (Ndebele) Snake bean (English)	Leprosy: Pod Wounds: Pod is ground into powder and applied to wounds.	[20, 23]
Amaryllidaceae	*Boophone disticha* (L.f.) Herb	Munzepete (Shona) Ingcotho (Ndebele) Tumbleweed, Veld fan, Windball (English)	Burns, wounds, and rash: Bulb crushed and applied to burns, wounds, and rash.	[23, 30]
Fabaceae	*Brachystegia spiciformis* Benth.	Msasa, Musasa, Mutatsa (Shona) Igonde (Ndebele)	Wounds: Bark is placed directly over the wound.	[31]
Fabaceae	*Burkea africana* Hook	Mukarati (Shona) Umnondo (Ndebele) Wild syringe, Burkea, False ash (English)	Tropical ulcers: Bark powder applied to ulcers. Septic sores.	[23]

Rubiaceae	*Canthum lividum* Hiern	Munyingahonye, Ruvengahonye (Shona) Umhlahlampethu (Ndebele)	Wounds infested with maggots: Leaves powder is applied to wounds.	[23, 32]
Apocynaceae	*Carissa edulis* (Forssk.) Vahl	Mudyabveni, Mudzambara, Muruguru, Mutsamviringa (Shona) Umlugulu (Ndebele) Simple-spined num-num (English)	Abscess: Root hot fomentation.	[23, 32]
Celastraceae	*Catha edulis* (Vahl.) Endl.	Mutswahari, Muzvaravashava (Shona) Umnanjana, Inandinandi (Ndebele) Bushman's tea, Khat (English)	Boils: Root infusion.	[23]
Vitaceae	*Cissus quadrangularis* L.	Murunjurunju, Muvengahonye, Renja (Shona)	To treat wounds infested with maggots: The Whole plant is crushed and applied to the wound.	[23, 32]
Cucurbitaceae	*Citrullus lanatus* (Thunb.) Monsf.	Mwiwa (Shona), Inkabe (Ndebele) Tsamma melon, Water Melon (English)	Lumps in the skin: Cook fruit and use the liquid on the lumps.	[23]
Rutaceae	*Clausena anisata* (Willd.) Benth.	Muvengahonye, Muvhunambezo (Shona) Horsewood, Maggot killer (English)	To treat wounds infested with maggots: Leaves crushed and applied to wounds.	[23]

Verbenaceae	*Clerodendrum glabrum* E. Mey.	Munyakachembere, Ruwudziwudzi (Shona) Umdolo, Umhlahlampethu, Umnukanja, Umxothanja (Ndebele) White cat's whiskers, Hairy tinderwood (English)	Rash: Leaves are rubbed on the whole body.	[23]
Combretaceae	*Combretum molle* R.Br ex G. Don	Mubondo (Shona), Mudziyaishe (Shona), Mugoro (Shona), Mukomahamba (Shona), Mupembere (Shona), Umbhondo (Ndebele), Velvet bushwillow (English)	As a dressing for wounds.	[33]
Combretaceae	*Combretum platypetalum* Laws.	Bepu (Shona) Dwarf red combretum, Red wings (English)	Burns: Leave the ointment applied to burns.	[23]
Euphorbiaceae	*Croton gratissimus* Burch. var. *gratissimus*	Gunukira, Mubangwa, Mufandemengwe, Mufarata (Shona) Lavender croton (English)	Wounds	[27]
Fabaceae	*Dalbergia melanoxylon* Guill. & Perr.	Murwiti (Shona) Umbambangwe (Ndebele) Blackwood dalbergia, Zebrawood, African blackwood (English)	Wounds: Bark powder applied to wounds. Bark is placed directly over the wound.	[23, 31]

Fabaceae	*Dalbergia nitidula* Bak.	Mudima, Murima, Ruvengahonye (Shona) Purple-wood dalbergia, Glossy flat-bean (English)	Tropical ulcers: Bark infusion is used to wash ulcers.	[23]
Solanaceae	*Datura stramonium* L.	Jimson weed, Thorn apple (English)	Boil: Root and leaves: Boil the root and leaves in water.	[23]
Pedaliaceae	*Dicerocaryum zangebarium* (Lour.) Merr.	Intekelane, Inkunzane (Ndebele) Boot protectors, Devil thorn, Stud thorn (English)	Measles: Leaves are used to wash the body, and the decoction of the root is taken orally.	[23, 31]
Fabaceae	*Dichrostachys cinerea* (L.) Wight & Arn.	Mumhangara, Mupangara, Muruka, Musekera (Shona) Ugagu (Ndebele) Chinese lantern, Sickle bush (English)	Scabies: Scabicide ointment applied to the skin. Leprosy: Leaves powder mixed with porridge and taken by mouth. Wounds: Leaves and roots.	[23, 34, 35]
Asteraceae	*Dicoma anomala* Sond	Chifumuro (Shona) Ukhalimela (Ndebele) Fever bush, Stomach bush (English)	Skin sores: Root ointment applied to the skin.	[36, 37]
Apocynaceae	*Diplorhynchus condylocarpon* (Muell. Arg.) Pich.	Musikanyimo, Mutohwa, Tsowa (Shona) Inkamamasane (Ndebele) Wild rubber, Horn-pod tree (English)	Measles: Root powder taken orally.	[23]
Fabaceae	*Dolichos kilimand-scharicus* Taub.	Veld lupin (English)	Measles: Tuber decoction is used to wash the body, and ointment is applied to the body.	[23]

Verbenaceae	*Duranta errecta* L	Sky Flower, Forget-me-not tree, Golden dewdrop (English)	Infections (fungal and bacterial): Leaves, roots, bark, and fruits.	[24]
Celastraceae	*Elaedendron matabelicum* Loes.	Murunganyama, Murungamunyu (Shona) Umgugudu (Ndebele) Condiment saffron (English)	Abscesses, carbuncles: Roots.	[34, 35]
Fabaceae	*Erythrina abyssinica* DC.	Munhimbiti, Mutete, Mutiti, Mutsiti (Shona) Umgqogqogqo (Ndebele) Red-hot-poker tree, Lucky-bean tree (English)	Measles: Bark cooked together with seeds of *Vigna unguiculata,* the resulting soup taken orally. Wounds: Root infusion is used to wash wounds.	[23, 29]
Ebenaceae	*Euclea crispa* (Thunb.) Guerke	Madziyire (Shona) Blue guarri, Blue-leaved euclea (English)	Measles: Root ground into powder and rubbed on the body.	[23]
Orchidaceae	*Eulophia parvula* (Rendle) Summerh.		Wounds: Tuber juice rubbed on wounds.	[23]
Rubiaceae	*Fadogia ancylantha* Hiern (*F. obovata* N.E.Br.)	Musvisvinwa (Shona) Makoni tea bush (English)	Tropical ulcers: Root powder applied to ulcers.	[23]
Moraceae	*Ficus sur* Forssk.	Mukuyu (Shona), Umkiwa (Ndebele) Broom-cluster fig, Cape fig (English)	Rash: Bark powder applied to skin.	[23]

Euphorbiaceae	*Flueggea virosa* (Roxb. ex Willd.) Voigt	Muchagauwe, Mudyambuzi, Mushikiti, Musosoti, Muzurumbu (Shona) Umhagawuwe, Umklankomo (Ndebele) Snowberry tree (English)	Wounds: Root powder applied to wounds. Rash: Root burnt and ointment applied to the body.	[23, 29]
Thymelaeaceae	*Gnidia kraussiana* Meisn.	Chitupatupa (Shona) Isidikili (Ndebele) Yellow-heads (English)	Measles: Tuberculin injection is used to test the body. Tropical ulcers: Tuber crushed and applied to the ulcer Boils: Freshly crushed tuber and boiled.	[23]
Tiliaceae	*Grewia flavescens* Juss.	Mubhununu, Mujonjoma, Mumhudzungwa (Shona) Ubhunzu, Umklampunzi, Umnaba, Umtewa (Ndebele) Sandpaper raisin, Donkey-berry (English)	Measles: The Leaves are infused and dropped into the ears and nose, also taken by mouth.	[23]
Celastraceae	*Gymnosporia senegalensis* (Lam.) Loes	Chivhunabadza, Chizhuzhu, Mukokoba, Musosaguva, Mutsotsova (Shona) Isihlangu (Ndebele) Red spike-thorn, Confetti tree (English)	Measles: Root infusion.	[23]
Hernandiaceae	*Gyrocarpus americanus* Jacq. subsp. *africanus* Kubitzki	Mundari (Shona) Propeller tree (English)	Wounds: Root heated and rubbed on sores.	[23]

Apiaceae	*Heteromorpha arborescens* (Spreng.) Cham. & Schltdl. *var. abyssinica* (A. Rich.) H. Wolff	Mhingano (Shona) Parsley tree (English)	Fungal infections: Leaves, bark, and roots	[24]
Hydnoraceae	*Hydnora solmsiana* Dinter	Hungumabwe (Shona) Hydnora (English)	Measles: Swollen underground stem infusion body wash and infusion taken orally.	[23]
Acanthaceae	*Hypoestes forskaolii* (Vahl) Roem. & Schult. subsp. *forskaolii*	White ribbon bush (English)	Ringworm: Roots of *H. forskaolii* and *D. anomala* are mixed to form an ointment that is applied to the affected parts.	[23]
Crassulaceae	*Kalanchoe spp.*	Kalanchoe (English)	Ringworm: Leaves infusion used as an enema.	[23]
Bignoniaceae	*Kigelia africana* Lam. Benth	Mubveve, Musonya, Muvhumati (Shona) Umvebe (Ndebele) Sausage tree (English)	Tropical ulcers: Bark or root powder of infusion applied to ulcers. Wounds, abscesses: Fruit, bark, and roots. Eczema and skin infections: Bark, fruit, root, and seeds. Skin ailments from boils, acne, fungal infections, skin cancer, and leprosy: Leaves ground into powder and mixed with castor oil and applied to affected areas.	[23, 24, 36]

Kirkiaceae	*Kirkia acuminata* Oliv.	Mubvumira, Mutsakatidze, Mutuhwa (Shona) Umvumile (Ndebele) White seringa, White syringa (English)	Wounds: Fruit juice applied to wounds.	[23, 29]
Anacardiaceae	*Lannea discolour* (Sond.) Engl.	Chizhenje, Mugan'acha, Muhumbukumbu, Mumbumbu, Mupuri, Mushamba (Shona) Tree grape, Live-long (English)	Wounds: Fibre used as a bandage.	[23]
Anacardiaceae	*Lannea edulis* (Sond.) Engl.	Mutsambatsi, Tsombori (Shona) Intakubomvu (Ndebele) Wild grape (English)	Wounds: Leaves	[38]
Verbenaceae	*Lantana camara L*	Mbarapati (Shona) Ubuhobe besikhiwa (Ndebele) Cherry pie, Lantana (English)	Ringworm: Leaf sap is applied to the body parts infected with ringworm.	[39]
Verbenaceae	*Lantana rugosa* Thunb.	Mubanda (Shona) Small lantana (English) Ubuhobe (Ndebele)	Skin itchiness: Leaves and roots. Ringworm infections - Leaves	[24, 27]
Asteraceae	*Launaea nana* (Bak.) Chiov.		Warts: The Root is applied to the incision on the wart.	[23]
Lamiaceae	*Leonotis ocymifolia* (Burm. f.) Iwarsson var. ocymifolia *Leonotis leonitis* R,Br	Mudyatsonzo (Shona) Ibhetshulebadala (Ndebele) Wild dagga (English)	Burns: Flowers and root ointments are applied to burns.	[23]

Rubiaceae	*Leptactina benguelensis* (Wehr. Ex Benth. & Hook.f.) Good	Ivory carpet (English)	Tropical ulcers: Root ashes applied to ulcers.	[23]
Verbenaceae	*Lippia javanica* (Burm.f.) Spreng	Kachigwere, Mumara, Mushani Zumbani (Shona) Umsuzwane (Ndebele) Fever tea, Lemon bush (English)	Measles: The Leaves infusion is taken orally, and the body is washed with the infusion.	[23, 26]
Asteraceae	*Lopholaena coriifolia* (Sond.)	Chigunguru, Mugakatombo, Mukwiradundu, Nyakatondo (Shona) Small-leaved fluff-bush (English)	Measles: Root infusion taken orally. Burns: Root powder applied to wounds.	[23]
Dipterocarpaceae	*Monotes engleri* Gilg.	Muaraara, Mubaravashava, Munhete, Munyunya, Muwara (Shona) Inyunya (Ndebele) Pink-fruited monotes (English)	Leprosy: Fresh leaves are rubbed on the body, and the body is washed with an infusion. Wounds: Bark infusion is used to wash wounds. Rash: Bark decoction taken orally.	[23]
Dipterocarpaceae	*Monotes glaber* Sprague	Muaraara, Mubaravashava, Muwara (Shona) Inyunya (Ndebele) Pale-fruited monotes (English)	Leprosy	[40]
Myrothamnaceae	*Myrothamnus flabellifolius* (Sond.) Welw	Mufandichimuka (Shona) Umfvuke (Ndebele) Resurrection bush (English)	Tropical ulcers: Root infusion is used to wash ulcers.	[23]

Solanaceae	*Nicotiana tabacum* L.	Chikwarimba, Fodya (Shona) Hunga (Shona) Igwayi (Ndebele) Tobacco (English)	Warts: Fresh root rubbed on the wart. Wounds: Leaves soot and powder mixed with snuff and applied to wounds.	[23]
Lamiaceae	*Ocimum obovatum* Benth.	Chikomamatadza (Shona) Cat's whiskers (English) Idada, Iziba, Ufukuzela, Umathanjane (Zulu)	Tropical ulcers: Leaves are crushed and applied to ulcers.	[23]
Chrysobalanaceae	*Parinari curatellifolia* Planch, ex Benth	Mubuni, Muchakata, Muhacha, (Shona) Umkhuna (Ndebele) Hissing tree, Mobola plum (English)	Skin rashes: Leaves	[26, 27]
Poaceae	*Phragmites mauritianus* Kunth	Tsanga (Shona) Umhlanga (Ndebele) Reed grass (English)	Wounds: Leaves with sharp ends are rubbed on wounds.	[41]
Asteraceae	*Pleiotaxis eximia* O.Hoffm.	Chipenzahwari (Shona)	Tropical ulcers: Root powder applied to ulcers.	[23]
Urticaceae	*Pouzolzia mixta Solms*	Munanzva, Tasva (Shona) Isikhukhukhu (Ndebele) Snuggle-leaf, Soap nettle (English)	Burns: Root paste applied to burns. Open wounds: Fibre used to stitch wounds. Wounds: Root powder applied to wounds.	[23, 29, 39]
Euphorbiaceae	*Pseudolachnostylis maprouneifolia* Pax	Mudyamhembwe, Mukuvazviyo, Mutsonzowa (Shona) Duiker-berry, Kudu-berry (English)	Wounds: Root ground into powder and applied to wounds. Skin rashes and infections: Leaves	[23, 24]

Combretaceae	*Psidium guajava* L.	Guava (English) Mugwavha (Shona)	Boils: Leaves decoction taken by mouth Leprosy: Root powder mixed with the blood of a goat, and the mixture is then rubbed on the skin. Scabies: Root powder applied to skin.	[23]
Clusiaceae	*Psorospernum febrifugum* Spach.	Mumhinu, Muparadzamusha (Shona) Umchithamuzi (Ndebele) Christmas berry (English)	Head wounds: Root mixed with oil from *Ricinus communis* seeds, and applied to wounds. Root ashes are applied to penile wounds.	[23]
Fabaceae	*Pterocarpus angolensis* DC.	Mubvamakovo, Mukwa, Mubvamaropa, Mubvinziropa, Mukambira, Mukonambiti, Mukurambira, Mukwirambira, Mushambaropa (Shona) Muzwamulowa, Mukula (Tonga) Umvagazi (Ndebele) Bloodwood, Mukwa (English)	Ringworm: Flowers applied to the incision made on the ringworm Head wounds: Fruit ointment is applied to wounds. Ulcers: Bark powder is applied to ulcers.	[23, 32]
Fabaceae	*Rhynchosia resinosa* (A. Rich) Bak.	Dapanyuchi, Zambazeze, Mushambavazvere, Mutandemutande (Shona)	To expel maggot from wounds: Whole plant infusion used to wash wounds.	[23, 32]
Euphorbiaceae	*Ricinus communis* L.	Mupfuta (Shona) Umhlafutho (Ndebele) Castor-oil plant (English)	Measles: Seed ointment applied to whole body. Wounds and sores.	[23, 30]

Asparagaceae	*Sansevieria hyacinthoides* (L.) *Druce*	Other-in-law's tongue, piles root (English) Bowstring hemp (English)	Skin infections (chickenpox, leprosy, and measles): Leaves, rhizomes, roots, and whole plant	[42, 43]
Fabaceae	*Schotia brachpetala* Sond. *Schotia semireducta* Merxm.	Mutondochuru, Nyamari, Mutondoshuru,Mutondosvi, (Shona) Weeping boer-bean, Fuchsia tree, Weeping schotia, African walnut (English)	Tropical ulcers: Leaves powder applied to ulcers.	[23, 30]
Anacardiaceae	*Searsia chirindensis* (Baker f.) Moffett	Mubikasadza (Shona) Red currant rhus (English)	Measles: Leaves and roots	[34, 35]
Anacardiaceae	*Searsia lancea* (L.f.) F.A. Barkley	Mufokosiana (Shona) Uchane, Inhlokotshiyane (Ndebele) African sumac, Willow rhus, Bastard willow (English)	Measles: Leaves infusion taken orally.	[23]
Anacardiaceae	*Searsia leptodictya* (Diels) T.S. Yi, A.J. Mill. & J. Wen	Rock rhus (English)	Measles: Root and leaves infused and body washed with infusion.	[23]
Polygalaceae	*Securidaca longipedunculata* Fresen.	Chipvufanana, Mufufu, Munyapunyapu, Munyazvirombo, Mutangeni (Shona) Umfufu (Ndebele) Violet tree (English)	Tropical ulcers: Root infusions used to wash wounds.	[23]

Solanaceae	*Solanum campylacanthum* 'panduriforme type'	Munhomboro, Munhundurwa, Nhundurwa (Shona) Poison apple (English) Snake apple (English) Sodom apple (English) Thorn apple (English) Bitter apple (English) Umdulukwa, Intume (Ndebele)	Scabies: Fruit Tropical ulcers: Leaves powder is applied to ulcers. Ringworm: Fruit juice squeezed into the lesion. Fruits: child bathed with fruit macerate as a remedy for scabies Wounds: Leaves, roots and fruit	[23, 24, 27, 29, 32, 39]
Asteraceae	*Stomatanthes africanus* (Oliv. & Hiern) King & Robison *(Eupatorium africanum* Oliv. & Hiern)		Wounds: Root powder applied to wounds.	[23]
Myrtaceae	*Syzygium cordatum* Hochst. ex C. Krauss	Mukute, Muisu (Shona) Gihlu (Hlengwe) Imiswi (Ndebele) Munonyamansi (Tonga) Umdoni (Ndebele) Waterberry (English)	Skin rashes: Leaves and bark.	[20]
Asteraceae	*Tagetes minuta* L.	Khaki bush, Mexican marigold, Stinking Roger (English)	Wounds: Leaf infusion used to wash wounds.	[44]
Rubiaceae	*Tarenna neurophylla* (S. Moore) Bremek.	Mupfupa (Shona) Umgebe (Ndebele) Koppie butterspoon (English)	To drive maggots from wounds: Leaves crushed and applied to wounds.	[23, 32]

Combretaceae	*Terminalia sericea* DC.	Mangwe, Mukonono, Mususu, Mutabvu (Shona) Umangwe (Ndebele) Silver cluster-leaf, Silver terminalia (English)	Wounds: Bark powder applied to wounds and fibre used as a bandage.	[23, 33, 34]
Boraginaceae	*Trichodesma physaloides* (Fenzl) A.DC.	Bells of St Mary's (English) Warimwaka (Shona)	Wounds: Tuber paste is applied to wounds.	[23]
Boraginaceae	*Trichodesma zeylanicum* (Burm.f.) R.Br.	Late weed (English) Nyarumundu (Shona)	Wounds: Leaves powder and salt is mixed and applied to wounds.	[23, 39]
Tiliaceae	*Triumfetta welwitschia* Mast.	Ibofane (Ndebele)	Tropical ulcers: Tuber infusion taken orally.	[23]
Asteraceae	*Vernonia glabra* (Steetz) Vatke	Cornflower vernonia (English)	Burns: Leaves ashes rubbed on burns.	[23]
Olacaeceae	*Ximenia caffra* Sond.	Munhengeni, Mutengeni, Mutsvanzva (Shona) Umthunduluka (Ndebele) Sourplum (English)	Wounds: Root powder applied to wounds. Burns	[23, 29, 39]
Polacea	*Zea mays* L.	Chibage (Shona) Umumbu (Ndebele) Maize (English)	Wounds: Cob infusion of ashes is used to wash wounds.	[23]

Zingiberaceae	*Zingiber officinale* Rosc	Tsangamidzi (Shona) Ginger (English)	Wounds: Roots are ground and the powder spread on minor cuts over 2-3.day period. Powder is mixed to a paste with boiling water for spreading on large, open wounds.	[31]
Rhamnaceae	*Ziziphus mucronate* Willd	Chinanga, Muchecheni (Shona) Umpasamala, Umphafa (Ndebele) Buffalo-thorn (English)	Wounds: Leaves powder applied to wounds. Boils: Fruit and leaves powder applied to boils. Leaves paste treats boils. Abscess and tumours. Carbuncles and swollen glands: Stems	[23, 25, 28, 32, 45]

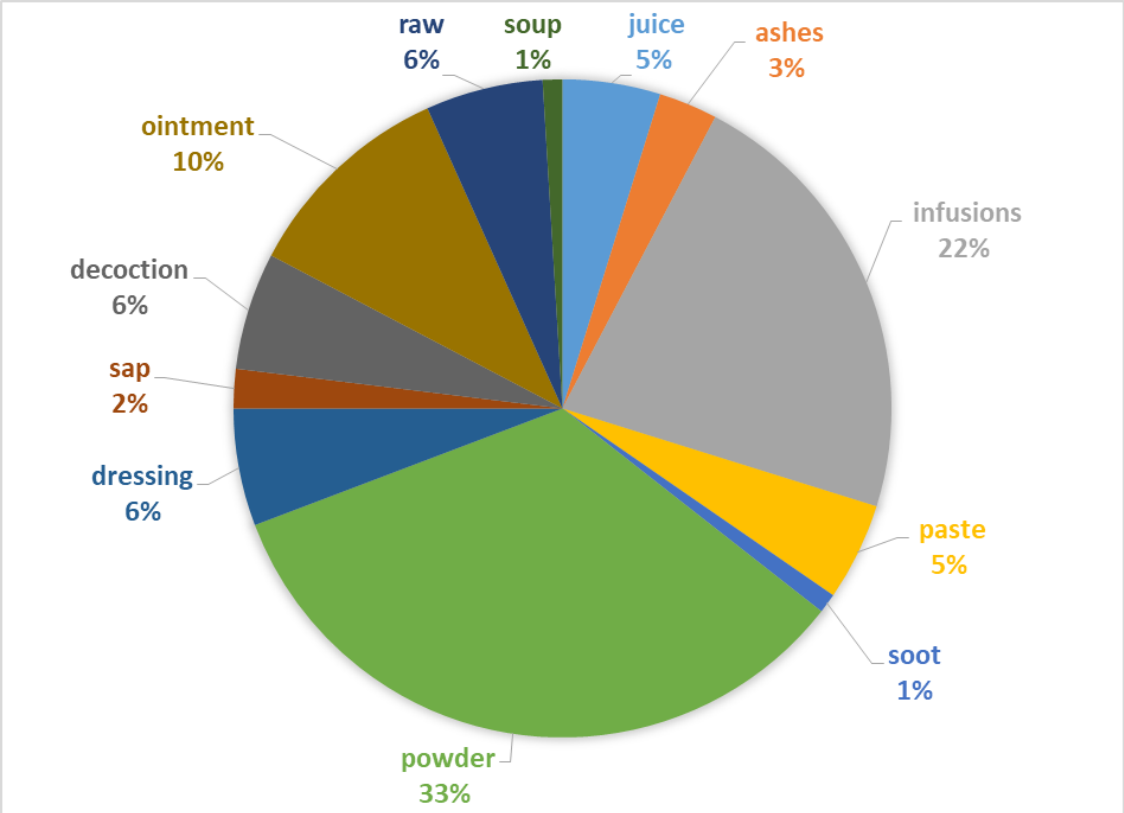

Figure 4 Mode of preparation of plants used for the treatment and management of skin conditions in Zimbabwe.

Ointments are created by combining finely ground herbal powder with petroleum jelly, oil, or wax. Ointments and plant poultices represent 8% of herbal preparations. Typically, a heated mass of plant material is used as a dressing, applied as either a cold or hot compress for treating superficial skin conditions such as urticaria, skin irritation, or sunburn. In these cases, antipruritic agents, skin-calming substances, or protective barriers like pastes may be utilized to manage the symptoms. Understanding the permeability of compounds in medicinal plants is crucial, as these compounds are expected to exert effects on the skin and should be suitable for their intended therapeutic purposes [18]. Various dressings can include mixtures such as salt, porridge, water (from infusions and decoctions), soup, castor oil, snuff, goat's blood, and other plants like *Vigna unguicalata, Dicoma anomala,* and *Ricinus communis* seeds. Preparation methods involve boiling, grinding, burning, cooking, crushing, heating, squeezing, and warming.

External Treatment: This involves rubbing herbal preparations on the body, washing with infusions, squeezing them into lesions, applying them to wounds, and using fibers as bandages or fomentations. Internal Treatment: These herbal remedies can also be taken orally. For instance, plants like *Abutilon angulatum, Boophone disticha, Combretum platypetalum*, and *Leonotis ocymifolia* are known to treat burns. Most documented medicinal plants are used topically, a method that is often preferred due to its lower risk of absorption and toxicity [46]. Studies have shown that applying *Aloe vera* gel twice daily for eight weeks can significantly reduce acne lesions and improve acne severity [47]. However, only a limited number of Zimbabwean medicinal plants have been scientifically researched for treating skin conditions.

This review primarily focuses on medicinal plants, without delving into their use as topical agents for cosmetic purposes, skin-lightening effects, or other traditional applications. These plants are known for their ability to improve skin tone and provide anti-aging, antibacterial, and anti-free radical benefits for aged, photoaged, stressed, and tired skin, offering both protective and restorative effects. While the emphasis here is on medicinal plants, further research into their cultural applications as topical agents should not be overlooked, as they play a significant role in traditional skincare practices.

3.5 Common Skin Conditions Treated Traditionally by Medicinal Plants in Zimbabwe

Traditionally, herbal remedies have been employed in Africa to treat and manage a diverse array of illnesses. Onayade et al. [48] described the use of plants in first aid, wound cleansing, wound washing, and pus extraction, as well as for infected and festering wounds. In addition, plants treat boils, abscesses, cuts, skin lesions, wounds, snake bites, insect bites, bruises, pains, ulcers, fractures, trauma, sprains, aches, suppurations, inflammations, scabies, rabies, and dress wounds. Some clinical practices used in wound management can be compared to those in African traditional medicine and Chinese traditional medicine, such as bone setting, fracture management, uvulectomy, abdominal surgery, trephination, and circumcision [49].

From our investigations, Table 1 presents a compilation of plants that have been and are currently being used in Zimbabwe for the treatment of different types of skin conditions. It has been reported that most plants used for dermatological purposes are related to wound healing as well [18]. This review found that 21 skin conditions in Zimbabwe are being treated using plant-based medicine (Figure 5). Zimbabwean traditional medical practitioners have utilized these herbal remedies for first aid, wound cleansing, pus extraction, and treatment of infected and festering wounds. They are also employed in the management of boils, abscesses, cuts, skin lesions, snake and dog bites, insect stings, bruises, pain relief, burn soothing, ulcers, fractures, sprains, aches, suppurations, inflammations, scabies, rabies, and wound dressing. Among the various skin conditions, wounds were found to be the most frequently treated using herbal remedies, followed by measles and tropical ulcers. On the other hand, skin cancers and tumors were observed to be the least treated diseases with herbs. *Aloe vera* has been observed to expedite the healing process in cases of chronic leg ulcers, surgically induced wounds, and frostbite. The data indicate that one specific plant is used in the treatment of various skin disorders. For example, burns can be treated using *Abutilon angulatum, Boophone disticha, Combretum platypetalum,* and *Leonotis ocymifolia,* among other plants.

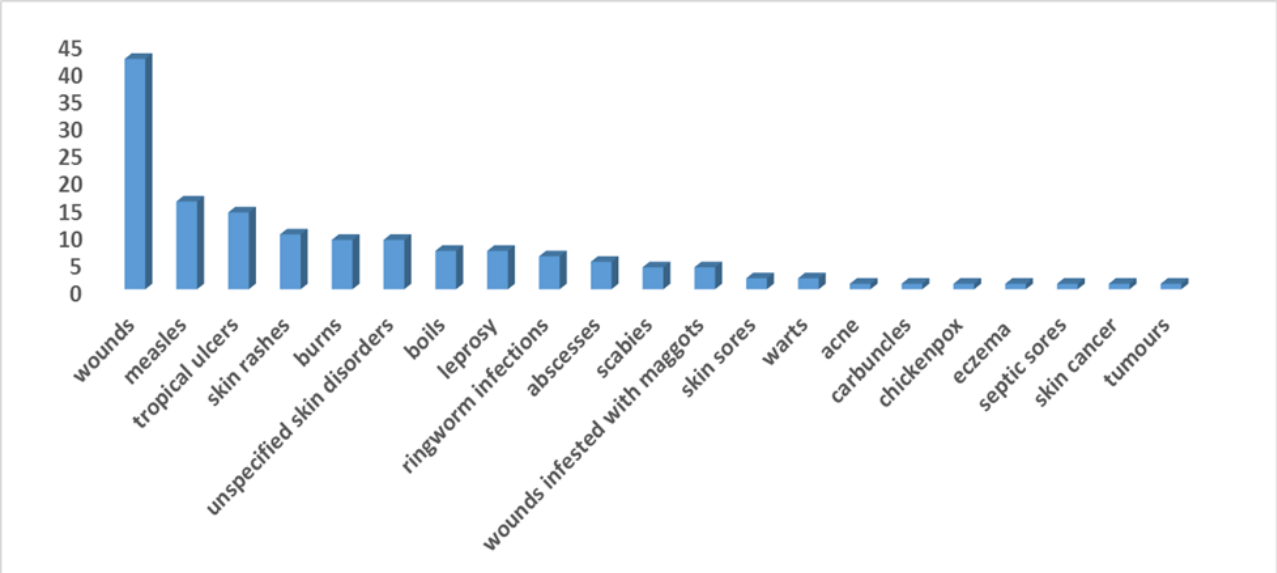

Figure 5 Common skin conditions treated traditionally by medicinal plants in Zimbabwe.

3.6 Pharmacological Properties of Medicinal Plants Used in Zimbabwe for Treating and Managing Skin Conditions

The plants in Table 2 exhibit diverse activities and mechanisms of action, contributing to their effectiveness in treating and managing skin conditions. They possess cicatrizant, antiseptic, antifungal, antiviral, antibacterial, antioxidant, antipyretic, anesthetic, analgesic, hemostatic, antimicrobial, anti-inflammatory, growth-promoting, and collagen synthesis/fibroblast formation-enhancing properties [48]. Some plants aid in wound closure, with or without scar formation, while others stimulate glycosaminoglycan synthesis.

Table 2 Pharmacological and toxicological assessment in terms of LD_{50} (Lethal Dose 50%) and LC_{50} (Lethal Concentration 50%) of medicinal plants used in Zimbabwe for treating and managing skin conditions.

Scientific name	Pharmacological activities	Toxicological profile	References
Abuitilon angulatum	no records found	no records found	
Acalypha brachiata	no records found	no records found	
Albizia anthelmintica	Antioxidant, anti-inflammatory, gastro-protective analgesic, antibacterial, antipyretic, anthelmintic, and for the prevention of hemorrhage after birth.	Moderately toxic LC_{50} - 259 µg/ml	[50-55]
Alepidea amatymbica	Antimicrobial, antiviral, anti-HIV, cardiovascular, diuretic, antioxidant, genotoxicity, antibacterial, antifungal, anti-plasmodial, hypertensive, cytotoxic, antiprotozoal, and anti-inflammatory properties.	No records found Records found indicated that LC_{50} at two ng/ml, no toxicity with Hala vero cells, generally no to mild adverse effects.	[56-61]
Aloe spp.	Antiviral, antibacterial, hypoglycemic, anti-inflammatory, immunomodulatory, antifungal, and gastro-protective properties.	Safe LD_{50} 2000 mg/kg BW	[62, 63]
Aloe barbadensis	Anti-inflammatory, antibacterial, laxative, protection against radiation, antioxidant, anticancer, antidiabetic, antiallergic, antiviral, wound healing, antimicrobial, anti-tussive, and immunomodulatory activities.	Safe LD_{50} 3000 mg/kg	[64-72]
Annona stenophylla	Antifungal, antibacterial, antifertility, antioxidant, anti-inflammatory, and hypoglycaemic activities.	Safe LC_{50} µg/ml - leaves 1190 ± 212 µg/ml and roots 2300 ± 276 µg/ml non-toxic LD_{50} > 2000 mg/kg	[73-75]

Asparagus africanus	Diuretic, antifertility, anti-implantation, oestrogenic, anti-diabetic, antiprotozoal, antimicrobial, analgesic, anticonvulsant, and anti-inflammatory activities.	Safe LD_{50} > 5000 mg/kg	[24, 74, 76-81]
Bidens pilosa	Antioxidant, muscle relaxant, pain-relieving, anti-histamine, anti-hepatic, anti-malarial, anti-diabetic, anti-allergy, anti-cancerogenic, anti-secretory, anti-ulcer, anti-allergic, anti-inflammatory, antimicrobial, anti-hypertensive, wound healing, immunomodulatory, anti-Herpes simplex virus, and smooth muscle relaxant activities.	Weak or low toxicity or mildly toxic LD_{50} up to 1000 mg/kg BW	[69, 82-89]
Bobgunnia madagascariensis	Antimicrobial, nephroprotective, anti-malarial, molluscicidal, antifeedant, insecticidal, hypoglycemic, and antioxidant activities.	Toxic LD_{50} of 288.5 mg/kg	[90-96]
Boophone disticha	Anticholinergic, hallucinogenic, anti-inflammatory, antimicrobial, anticancer, anticholinesterase, anxiolytic-like, antifungal, cardiovascular, antidepressant, and antibacterial activities.	Toxic The estimated oral LD_{50} range is between 120 and 240 mg/kg.	[97-104]
Brachystegia spiciformis	no records found	no records found	
Burkea africana	Antioxidant, anti-diarrhoeal, antibacterial, analgesic, anti-inflammatory, sedative, anticholinesterase, antinociceptive, anticonvulsant, anti-pyretic, and anxiolytic activities.	Safe LD_{50} > 5000 mg/kg non-toxic	[105-110]
Canthum lividum	no records found	no records found	
Carissa edulis	Antimicrobial, anti-plasmodial, diuretic, antioxidant, antiherpetic, wound healing, analgesic, antiviral, erythropoietic, myorelaxant, and anti-inflammatory activities.	Safe The LD_{50} is 2154.1 mg/kg, which is said to be slightly toxic. Non-toxic LD_{50} > 2000 mg in rats	[111-119]

Catha edulis	Sympathomimetic, embryotoxic, anti-inflammatory, cardiovascular, amphetamine, immunomodulatory, euphoric, analgesic, psychostimulant, arterial constriction, antimicrobial, genotoxicity, increased oxygen consumption, antioxidant, and anti-acanthamoebic activities.	Safe The acute toxicity study showed that the tested doses of crude khat (100 and 200 mg/kg) extract and cathinone (5 mg/kg) caused no mortality.	[120-133]
Cissus quadrangularis	Bone healing, wound healing, anti-tumor, anti-inflammatory, anti-ulcer, anti-obesity, anti-ulcerative, antifungal, cytotoxic, molluscicidal, gastro-protective, antioxidant, and antimicrobial activities.	Safe LD_{50} - 3000 mg/kg LC_{50} - 1300 µg/ml	[134-140]
Citrullus lanatus	Anti-cancer, anti-urolithiatic, diuretic, insecticidal agents, anti-diabetic, skin care, antibacterial, antifungal, antiulcer, antimicrobial, reduces atherosclerosis, wound healing, and anti-inflammatory activities.	Safe LD_{50} - 2000 mg/kg body weight	[141-148]
Clausena anisata	Antiviral, hypoglycemic, antinociceptive, antimalarial, anti-inflammatory, antinflammatory, anticonvulsant, antidiabetic, antifungal, antibacterial, wound healing, anticoagulant, and angiotensin converting enzyme (ACE) inhibitory activity	Safe LD_{50} of mice that received the chloroform extract was 4166.7 mg/kg.	[149-155]
Clerodendrum glabrum	Antimicrobial, antihypertensive, antioxidant, anti-aging, anti-inflammatory, and immunostimulatory activities.	no records found	[156, 157]
Combretum platypetalum	Cytotoxic, anticancer, anti-tuberculosis, antioxidant, antifungal, antibacterial, anti-proliferative, and anti-inflammatory activities.	no records found	[158-161]
Combretum molle	Anti-HIV, anti-plasmodium, antibacterial, antifungal, anthelmintic, analgesic, anti-inflammatory, hypoglycaemic, wound healing, therapeutic, ameliorative, antioxidant, and cardiovascular activities.	Safe Above 2000 mg/kg.	[162-173]

Croton gratissimus	Antioxidant, anti-diabetic, anti-inflammatory, antibiotic, antiviral, anticancer, immunomodulatory, anti-pyretic, analgesic, antileishmanial, anti-plasmodial, anticonvulsant, antiulcer, hypolipidemic, antiarthritic, anti-eczemic, antihistimic, and anti-coronary properties.	Highly toxic LC_{50} Hexane fraction - 25.3 ± 0.87 µg/ml.; DCM fraction - 67.3 ± 0.32 µg/ml.	[173-179]
Dalbergia melanoxylon	Antidiarrhoeal, antimicrobial, analgesic, antiviral, antioxidant, antipyretic, and anti-inflammatory activity.	Highly Toxic Brine shrimp toxicity of stem bark – LC_{50} 6.8 µg/ml	[39, 180-182]
Dalbergia nitidula	Antibacterial, anthelmintic, anti-inflammatory, antioxidant, analgesic, low cytotoxicity, anti-spermicidal, larvicidal, ulcerogenic, aphrodisiac, anti-plasmodial, antimicrobial, antipyretic, astringent, and expectorant activities.	Highly Toxic Roots LC_{50} - 0.87 µg/ml	[108, 183-186]
Datura stramonium	Anti-inflammatory, antispasmodic, antiasthematic, hypnotic, wound healing, narcotic, antiviral, antimicrobial, analgesic, antidiabetic, antioxidant, anticancer, and anti-asthmatic activities.	Weak or low toxicity or mildly toxic LC_{50} obtained by Brine Shrimp Lethality Assay - 12.86 mg/ml LD_{50} - 821.93 mg/kg	[187-194]
Dicerocaryum zangebarium	Anti-inflammatory, anti-proliferative, hair growth stimulation, antimicrobial, antioxidant, anticancer, and antifungal activities.	no records found	[195-200]
Dichrostachys cinerea	Bronchoconstriction & bronchodilation, antioxidant, anticonvulsant, antiashmatic, anti-inflammatory, antiviral, analgesic, and antimicrobial activities.	Safe LC_{50} value of 4304.59 ± 685.69 µg/ml.	[34, 35, 37, 201-204]
Dicoma anomala	Anti-plasmodial, anthelmintic, anticancer, antioxidant, antihyperglycemic, anti-inflammatory, cardioprotective, antimicrobial, and hepatoprotective activities	Safe LC_{50} value of 3040 ± 1060 µg/ml.	[75, 205-208]
Diplorhynchus condylocarpon	Sympatholytic activity.	no records found	[108]

Dolichos kilimand-scharicus	Antibacterial, cytotoxic, antimicrobial, and anticancer activities	no records found	[209-211]
Duranta errecta	Wound healing, antifungal, insecticidal, diuretic, anti-malarial, anti-plasmodial, antitumor, antioxidant, antibacterial, and antimicrobial activities.	Safe LD_{50} > 5000 mg/kg body weight.	[24, 212-214]
Elaedendron matabelicum	Antimicrobial and antioxidant activities.	Safe LC_{50} value of 1012.31 ± 217.69 µg/ml	[34, 35, 202, 215]
Erythrina abyssinica	Anti-inflammatory, anti-mycobacterial, antidiarrheal, anti-plasmodial, antiviral, anti-diabetic, hepatoprotective, anti-obesity, antibacterial, antioxidant, anti-HIV-1, antifungal, anti-proliferative, wound healing, and antimicrobial activities.	Safe LC_{50} µg/ml - roots 5 440 ± 0 µg/ml. The acute toxicity test gave an LD_{50} of 776.2 mg/kg.	[75, 134, 216-220]
Euclea crispa	Antibacterial, antioxidant, amyloid β-peptide-lowering effects, antifungal, cytotoxicity, anti-inflammatory, and cell membrane disruption activities	no records found	[221-223]
Eulophia parvula	no records found	no records found	
Fadogia ancylantha	Anti-diabetic, hepatoprotective, antioxidant, and antimicrobial activities.	no records found	[224-228]
Ficus sur	Anticonvulsant, antimalarial, diuretic, anti-inflammatory, anti-diarrheal, wound healing, larvicidal, antimicrobial, gastrointestinal, antioxidant, antibacterial, ameliorative, haematinic, mutagenic, anti-cholinesterase, and anti-anaemic activities.	Weak or low toxicity or mildly toxic LD_{50} values ranged from 900 to 1200 mg/kg in mice.	[229-241]

Flueggea virosa	Antimicrobial, antifungal, antioxidant, analgesic, anti-inflammatory, aphrodisiac, sedative, anti-arrhythmic, laxative, anti-diabetic, anti-malarial, anti-HIV, anti-hepatitis C, anti-diarrheal, cytotoxic, antisickling, antispasmodic, antibacterial, antidiabetic, analgesic, CNS behavioural effects, anti-ulcerogenic, anticancer, anticonvulsant, sedative, anti-trypanosomal, FSH, anti-depressant, antivenin, and testosterone augmentative effect on LH activities.	Safe No toxicity test in rats, LD_{50} greater than 10000 mg/kg in rats.	[242-261]
Gnidia kraussiana	Antibacterial, antifungal, and molluscicidal activity.	No records found	[262, 263]
Grewia flavescens	Anthelmintic, anti-diabetic, analgesic, anti-inflammatory, CNS depressant, antimalarial, larvicidal, and antimicrobial activities.	Safe LD_{50} - 2000 mg/kg	[264-267]
Gymnosporia senegalensis	Antibacterial, antioxidant, antifungal, antiviral, anti-inflammatory, anti-plasmodium, and antileishmanial activities.	Safe LC_{50} value of 2185.61 ± 872. 25 µg/ml, were found to be safe to use.	[34, 35, 57, 202, 268-273]
Gyrocarpus americanus	Cytotoxic and antiprotozoal activities.	No records found	[62, 274, 275]
Heteromorpha arborescens	Anti-inflammatory, anthelmintic, anti-scabies, antiviral, cytotoxicity, anti-arthritic, genotoxicity, antibacterial, antifungal, anti-mycobacterial, COX-1 inhibition, antinociceptive, contractile effects, antispasmodic, uterotonic, antioxidant, and anti-peptic ulcer activities.	Highly toxic The extracts exhibited an LC_{50} value of 81.0 µg/ml	[276, 277]
Hydnora abyssinica	Antioxidant, antibacterial, antifungal, anti-glycation, anti-diarrhoeal, cytotoxic, anticancer, and immunomodulatory activity.	Weak or low toxicity or mildly toxic LD_{50} - 1600 mg/kg body wt.	[278-285]

Hypoestes forskaolii	Antimalarial, anti-plasmodial, larvicidal, antioxidant, anthelmintic, antileishmanial, antifungal, antipyretic, antimicrobial, anti-trypanosomal, anti-inflammatory, and cytotoxic properties.	Safe LD_{50} > 2000 mg/kg in mice.	[286-289]
Kalanchoe spp.	Immunomodulatory, antimicrobial, anti-inflammatory, antioxidant, anti-allergic, antihistamine, and antimalarial activities.	Weak or low toxicity or mildly toxic K. laciniata - LD_{50} was 1925 mg/kg	[290]
Kigelia africana	Wound healing, antiviral, anti-plasmodial, anticancer, antiulcer, antidiarrheal, anti-trypanosomal, antimicrobial, analgesic, antioxidant, and anti-inflammatory activities.	Safe LC_{50} < 300 µg/ml. LC_{50} value of 117.41 ± 30.27 µg/ml	[34, 35, 291, 292]
Kirkia acuminata	Antibacterial, antiviral, antioxidant, anti-mycobacterial, anti-inflammatory, analgesic, and anti-plasmodial activities.	no records found	[293-295]
Lannea discolor	Antifungal, antimycobacterial, anti-plasmodial, anthelmintic, antibacterial, antioxidant and nematicidal activities.	Safe The extracts exhibited low toxicity against the three cell lines, with the median lethal concentration values ranging from 0.408 mg/mL to >1.0 mg/mL.	[296-298]
Lannea edulis	Anthelmintic, antimalarial, anti-human immunodeficiency virus, antioxidant, antihyperglycemic, antihyperlipidemic, antimicrobial, pro-inflammatory, and cytotoxicity activities.	Safe The LD_{50} > 6000 mg/kg and falls within the nontoxic range	[38, 75, 299, 300]
Lantana camara	Antiulcer, analgesic, anti-inflammatory, antimicrobial, anthelmintic, anti-cancer, antifungal, antibacterial, wound healing, larvicidal, diuretic, antiseptic, diphoretic, antispasmodic, carminative, and anti-pyretic activities.	Safe LC_{50} values; Root - 940.7 µg/mL, Stem - 3966 µg/mL, Leaf - 3251.8 µg/mL, and Flower - 5536.6 µg/mL	[301-304]

Lantana rugosa	Anthelmintic, antibacterial, antifungal and cytotoxicity activities.	Weak or low toxicity or mildly Toxic LC_{50} - 690 µg/ml	[305, 306]
Launaea nana	no records found	no records found	
Leonotis ocymifolia	Analgesic, anti-inflammatory, ascaricide, anticancer, antimicrobial, anthelmintic, and antimalarial activities.	Safe LD_{50} > 2000 mg/kg	[307-311]
Leptactina benguelensis	No records found	no records found	
Lippia javanica	Antiviral, anti-inflammatory, antioxidant, anti-microbial, antimycobacterial, anti-amoebic, antifungal, antibacterial, and antiplasmodial activities.	Safe LC_{50} 1138 ± 1.33 µg/Ml, 35% mortality in mice after 48 hours	[44, 227, 312, 313]
Lopholaena coriifolia	Antioxidant, 5-LOX Inhibitory, and anti-inflammatory properties.	no records found	[314]
Monotes engleri	Antifungal and HIV-inhibitory activities	no records found	[108, 315]
Monotes glaber	no records found	no records found	
Myrothamnus flabellifolius	Antimicrobial, anti-inflammatory, anti-diabetic, analgesic, antioxidant, and antiviral activities.	Highly Toxic LC_{50} at 136 µg/ml	[227, 316-319]
Nicotiana tabacum	Antimicrobial, antispasmodic, antiviral, antioxidant, emetic, purgative, sedative, analgesic, insecticidal, anti-inflammatory, anti-rheumatic, wound healing, and anthelmintic activities.	Safe LD_{50} > 2000 mg/kg	[320-327]
Ocimum obovatum	Radio-protective, antifungal, antioxidant, and antibacterial activities.	no records found	[328, 329]
Parinari curatellifolia	Antibacterial, ameliorative, antioxidant, hepatoprotective, anti-inflammatory, anti-venom, analgesic, cardiovascular, anti-proliferative, glutathione transferases, and anti-diabetic activities.	Non-toxic Roots ethanol extract LC_{50} > 1000 µg/ml	[160, 330-337]

Phragmites mauritianus	no records found	no records found	
Pleiotaxis eximia	no records found	no records found	
Pouzolzia mixta	Antibacterial, anthelmintic, antifertility, anti-implantation, and estrogenic activities.	Safe LC_{50} - 4500-5000 µg/ml LD_{50} > 4000 mg/kg b.wt.	[39, 338, 339]
Pseudolachnostylis maprouneifolia	Antioxidant, anti-inflammatory, antiviral, antifungal, and cytotoxic activities.	no records found	[340-342]
Psidium guajava	Antioxidant, antimicrobial, antiviral, anti-inflammatory, anti-spasmodic, analgesic, cytotoxic, cardioactive, anti-diarrhoeal, anti-allergy, hepatoprotective, anti-nociceptive, anti-diabetic, wound healing, anti-plasmodial, immunomodulatory, histologic, spermatoprotective and antitussive activities.	Safe LD_{50} ≥ 5000 mg/kg in rats	[343-354]
Psorospernum febrifugum	Anti-psoriatic, immunomodulatory, anti-acne, antibacterial, antiprotozoal, anti-inflammatory, antiviral, neuroprotective, antifungal, anticancer and antioxidant activities.	Safe Acute toxicity > 2000 mg/kg body weight.	[355-360]
Pterocarpus angolensis	Antibacterial, anti-plasmodial, antiviral, antioxidant, antifungal, anthelmintic, anti-inflammatory, wound-healing and potential cytotoxicity activities.	Safe LC_{50} - roots 1 320 ± 266; 1400-1500 µg/ml	[75, 338, 361-366]
Rhynchosia resinosa	no records found	no records found	

Ricinus communis L.	Anti-infertility, laxative, antioxidant, hepatoprotective, antiviral, anti-asthmatic, immunomodulatory, anticancer, anti-implantation, antimicrobial, antiulcer, wound healing, bronchodilatory, mast cell stabilizing, analgesic, smooth muscle relaxation, antihistaminic, lipolytic, in vitro hepatoprotective, molluscicidal, larvicidal, antinociceptive, antidiabetic, bone regeneration and anti-inflammatory activities.	Safe LD_{50} - 2000 mg/kg in rats.	[367-373]
Sansevieria hyacinthoides	Antibacterial, anthelmintic, antifungal, acetylcholinesterase inhibitory, anti-aging, and antioxidant activities.	no records found	[43, 374]
Schotia brachypetala	Antioxidant, larvicidal, antibacterial, monoamine oxidase-B inhibition, anti-aging, antiviral, anthelmintic, cytotoxic, antipyretic, acetylcholinesterase (AChE), and anti-plasmodial activities.	Safe LC_{50} - 3300 µg/ml	[157, 338, 375-381]
Searsia chirindensis	Anti-inflammatory, antiviral, antifungal, antioxidant, analgesic and antibacterial activities.	Safe LC_{50} value of 1023.26 ± 161.69 µg/ml.	[34, 35, 382, 383]
Searsia lancea	Healing properties, antibacterial, anti-inflammatory, antioxidant, and antifungal activities.	Weak or low toxicity or mildly toxic LC_{50} - 600 µg/ml	[27, 338, 384-386]
Searsia leptodictya	Antibacterial, antioxidant, cytotoxic, antimicrobial, and anti-lipoxygenase activities.	no records found	[387-390]
Securidaca longipedunculata	Antibacterial, antiviral, antimicrobial, anti-plasmodial, anti-inflammatory, and antifungal activities.	Moderately toxic LC_{50} - 351.89 ± 35.79 µg/ml, giving readings close to 300 µg/ml; bark 478 ± 29.7	[34, 35, 75, 361, 362, 391-394]

Solanum campylacanthum	Antimicrobial, anti-schistosomal, anti-cancer, anorexic, hypoglycemic, anti-cytotoxic, antifungal, antinociceptive, antipyretic, antispasmolytic, analgesic, antinociceptive effect, antimicrobial, anti-inflammatory, in the treatment of anemia, tissue regeneration, and wound healing.	Safe LD_{50} > 15,000 mg/kg LD_{50} > 2000 mg/kg body weight.	[395-399]
Stomatanthes africanus	Antimicrobial activity.	no records found	[400]
Syzygium cordatum	Antibacterial, antiplasmodial, antifungal, antidiarrheal, anti-sexually transmitted infections, antidiabetic, antioxidant, anti-inflammatory, antileishmanial, wound healing, anti-proteus, and anticholinesterase activities.	Safe LD_{50} > 4000 mg/kg in mice	[385, 401-407]
Tagetes minuta	Antibacterial, diuretic, cytotoxic, anti-inflammatory, antiviral, antiseptic, disinfectant, carminative, arthropod repellent, sedative, antifungal, anti-plasmodial, antioxidant, antitussive, anthelminthic, antimicrobial, hypotensive, tranquilizing, bronchodilatory, spasmolytic and anxiogenic-like activities.	no records found	[408-415]
Tarenna neurophylla	no records found	no records found	
Terminalia sericea	Anti-HIV, antibacterial, lipolytic, wound healing, anti-inflammatory, anticancer, anti-neurodegenerative, anti-diabetic, antioxidant, antifungal, and anti-parasitic activities.	Highly toxic LC_{50} < 300 µg/ml. LC_{50} ranging from 5.4 (3.5-8.4) to 17.4 (11.4-26.5) µg/ml, LC_{50} - 66.66 ± 49.31 µg/ml	[34, 35, 45, 416-419]
Trichodesma physaloides	no records found	no records found	

Trichodesma zeylanicum	Antibacterial, antioxidant, wound healing and antifungal activities.	no records found	[420-422]
Triumfetta welwitschii	Antibacterial and anticancer activities.	no records found	[423-425]
Vernonia glabra	Antibacterial, antifungal, wound healing, anti-giardial, anti-HIV, and acetylcholine-like activities.	no records found	[426-429]
Ximenia caffra	Anti-amoebic, antibacterial, skin care, antigonococcal agent, antifungal, anti-inflammatory, antioxidant, anti-parasitic, anti-proliferative, HIV-1 reverse transcriptase (RT) inhibitory, insecticidal, and non-mutagenic activities.	Highly Toxic LC_{50} - 11.25 µg/ml	[47, 185, 430-433]
Zea mays	Antimicrobial, antiproliferative, amylase inhibitory, antioxidant, nephroprotective, anticancer, hepatoprotective, analgesic, anti-inflammatory, anti-plasmodial, skin regeneration, and/or wound healing activities.	Weak or low toxicity or mildly toxic LD_{50} - 1732.05 mg/kg	[434-438]
Zingiber officinale	Antimicrobial, immunomodulatory, antioxidant, anticancer, antiviral, wound healing, antiemetic, anti-inflammatory, anti-apoptotic, anti-hyperglycemic, and anti-hyperlipidemic activities.	Safe LD_{50} exceeds 5000 mg/Kg.	[439-447]
Ziziphus mucronata	Antimicrobial, anti-diabetic, antioxidant, anti-inflammatory, anthelmintic, antiviral, anti-plasmodial, anticancer, and anti-anaemic activities.	Safe In a BSL assay, ethanol, methanol, and aqueous extracts revealed LC_{50} > 1000 µg/ml LD_{50} was found to be >5000 mg/kg	[45, 431, 448-450]

The mechanism through which these plants speed up the process of various skin conditions varies from plant to plant. The presented data represent a crucial source of traditional knowledge, especially regarding the use of herbal remedies in Africa for treating and managing skin conditions. Traditional knowledge in rural Zimbabwe identifies readily available plants with a historical record of treating skin disorders. However, scientific research on these plants remains limited. Herbal extracts from these plants likely contain diverse molecules with various functions relevant to managing and treating skin conditions. These functions include signaling, lubrication, proliferation support, wound contraction, and provision of cofactors, antioxidants, radical scavenging properties, and essential nutrients [451]. Furthermore, studies suggest the presence of key pharmacological properties like antimicrobial activity, radical scavenging, and antioxidant effects [134], which may help manage and treat skin conditions.

Pharmacological interaction studies of plants that are used in combination with other plants to treat skin infections lack thorough scientific research. Various cultures have recognized the therapeutic benefits of synergistic interactions, and traditional African healing systems often employ combination therapy based on this principle, with a belief that it enhances efficacy. However, ethnopharmacological information regarding these combinations usually lacks adequate scientific validation [18]. Emerging preclinical evidence by Hamza et al. [162] has shown the promising therapeutic potential of *Combretum molle*, a plant whose extracts exhibit significant potential in wound healing and ulcer repair, particularly in diabetic foot models and deep wound ulcers. In vivo wound healing progression documented through serial photographic captures demonstrates the extract's promising ability for skin regeneration, restoring healthy appearance, combating damaging effects, and stimulating antioxidant enzyme regeneration, highlighting its potential for therapeutic applications [162].

The pharmacological properties of medicinal plants used in Zimbabwe for skin conditions reveal a wide range of benefits, including antimicrobial, anti-inflammatory, antioxidant, and wound healing effects. Many species demonstrate multiple activities, enhancing their therapeutic potential. For example, *Psorospernum febrifugum* is recognized for its anti-psoriatic and anti-acne effects. At the same time, *Heteromorpha arborescens* is noted for its anti-scabies properties, and several other plants are reported to promote wound healing. Additionally, plants such as *Citrullus lanatus, Sansevieria hyacinthoides, Schotia brachypetala, Ximenia caffra*, and *Zea mays* are known for their anti-aging and skin regeneration benefits. This diversity reflects the rich biodiversity inherent in traditional medicinal practices across Zimbabwe, underscoring the vital role these plants play in health promotion and the effective management of skin conditions. This overview emphasizes their significant contribution to local healthcare.

3.7 Toxicological Evaluation of Medicinal Plants Used in Zimbabwe for Treating and Managing Skin Conditions

Basing our understanding of their potential therapeutic effects on traditional knowledge passed down through generations regarding medicinal plants has informed our understanding of their potential therapeutic effects. However, relying solely on this knowledge to assume the safety and absence of toxicity in these plants is not scientifically verified. Recent scientific studies have revealed the toxic, mutagenic, and carcinogenic properties of various plant species traditionally used for medicinal purposes. Despite their applications in treating skin conditions, these medicinal plants

have also been documented to induce adverse effects, including allergic reactions, phytodermatitis, and an increased risk of photosensitization. A review of the evidence bases for botanicals in dermatology conducted by Reuter et al. [452] identified several traditionally used medicinal plants with documented reports of associated toxic effects, with the toxicity evaluations depicted in Table 3.

Table 3 Toxicological evaluation of medicinal plants used by local people in Zimbabwe to treat and manage skin conditions.

Toxicological profile	No of plants	Names of the plant species
Safe or nontoxic **LC_{50} ≥ 1000 µg/ml** **2,000 ≤ LD_{50} ≤ 5,000 mg/kg body weight**	39	*Aloe spp, Aloe barbadensis, Annona stenophylla, Asparagus africanus, Burkea africana, Carissa spinarum, Catha edulis, Cissus quadrangularis, Citrullus lanatus, Clausena anisata, Combretum mole, Dichrostachys cinerea, Dicoma anomala, Duranta errecta, Elaedendron matabelicum, Erythrina abyssinica, Flueggea virosa, Grewia flavescens, Gymnosporia senegalensis, Hypoestes forskaolii, Kigelia africana, Lannea discolor, Lannea edulis, Lantana camara, Leonotis ocymifolia, Lippia javanica, Nicotiana tabacum, Parinari curatellifolia, Pouzolzia mixta, Psidium guajava, Psorospernum febrifugum, Pterocarpus angolensis, Searsia chirindensis, Ricinus communis, Schotia brachpetala, Solanum campylacanthum, Syzygium cordatum, Zingiber officinale, Ziziphus mucronata.*
Weak or low toxicity or mildly toxic **500 ≤ LC_{50} ≤ 999 µg/ml** **1,000 ≤ LD_{50} ≤ 2,000 mg/kg body weight**	8	*Bidens pilosa, Datura stramonium, Ficus sur, Hydnora abyssinica, Kalanchoe spp., Lantana rugosa, Searsia lancea, Zea mays*
Moderately toxic **250 ≤ LC_{50} ≤ 499 µg/ml** **300 ≤ LD_{50} ≤ 1,000 mg/kg body weight**	2	*Albizia anthelmintica, Securidaca longipedunculata*
Toxic **50 ≤ LD_{50} ≤ 300 mg/kg body weight**	2	*Boophone disticha, Bobgunnia madagascariensis*
Highly toxic **LC_{50} ≤ 249 µg/ml** **0 ≤ LD_{50} ≤ 50 mg/kg body weight**	7	*Croton gratissimus, Dalbergia melanoxylon, Dalbergia nitidula, Heteromorpha arborescens, Myrothamnus flabellifolius, Terminalia sericea, Ximenia caffra*

No records found	35	*Abuitilon angulatum, Acalypha brachiata, Alepidea amatymbica, Brachystegia spiciformis, Canthum lividum, Clerodendrum glabrum, Combretum platypetalum, Dicerocaryum senecioides, Diplorhynchus condylocarpon, Dolichos kilimand-scharicus, Euclea crispa, Eulophia parvula, Fadogia ancylantha, Gnidia kraussiana, Gyrocarpus americanus, Kirkia acuminata, Launaea nana, Leptactina benguelensis, Lopholaena coriifolia, Monotes engleri, Monotes glaber, Ocimum obovatum, Phragmites mauritianus, Pleiotaxis eximia, Pseudolachnostylis maprouneifolia, Searsia leptodictya, Rhynchosia resinosa, Sansevieria hyacinthoides, Stomatanthes africanus, Tagetes minuta, Tarenna neurophylla, Trichodesma physaloides, Trichodesma zeylanicum, Triumfetta welwitschia, Vernonia glabra.*

A scientific evaluation of the toxicological profiles of 93 Zimbabwean plants traditionally used for treating skin conditions was conducted. The analysis revealed that 58 plants (approximately 62.4%) have documented toxicological studies, while the remaining 35 plants (37.6%) lack such studies.

According to the assessment, medicinal extracts from the plants with published studies were evaluated for their effects on liver cells, genotoxicity, sub-acute toxicity, cytotoxic activity on human monocyte cells, and anticancer properties. To assess the toxic effects of the plants, laboratory tests were conducted using the Ames test (an in vitro test of bacterial and mammalian cells), the micronucleus test (chromosomes of white blood cells), and the comet test (DNA damage). Additionally, other toxicological effects of the plants were studied using the brine shrimp lethality test (BSLT) and the rodent acute toxicity test (RTA). As a result, Munodawafa et al. [75] suggested that these tests provide accurate, cost-effective, and simple assessments of herbal extract safety.

It is determined by the rodent acute toxicity test, also known as the Lethality Dose (LD_{50}) test. LD_{50} is the dose of a substance (usually in mg/kg of body weight) that causes death in 50% of test animals (typically rats or mice) within a specified time (often 24 hours to 14 days). It is used to assess acute toxicity (short-term poisoning potential) of chemicals, drugs, or plant extracts. Malebo et al. [453] established toxicity classifications based on dosage (mg/kg body weight). Substance is considered highly toxic when its dosage is <50 mg/kg body weight, toxic at 50-300 mg/kg, moderately toxic at 300-1000 mg/kg, mildly toxic: 1000-2000 mg/kg, non-toxic: 2000-5000 mg/kg body weight. LC_{50} (Lethal Concentration 50%) is the concentration of a substance (usually in µg/mL or ppm) in air, water, or another medium that kills 50% of test organisms for example fish, insects, or cell cultures over a set exposure period. Bussmann et al. [317] and Erhabor et al. [318] indicated that substances with LC_{50} values less than or equal to 249 µg/mL are highly toxic, those between 250 and 499 µg/mL are moderately toxic, those between 500 and 999 µg/mL are weak or low, and those above 1000 µg/mL are considered safe.

3.8 Phytochemical Evaluation of Medicinal Plants Used in Zimbabwe for Treating and Managing Skin Conditions

Phytochemicals exhibit a wide range of biological activities that contribute to skin health, including free radical scavenging, inhibition of radical chain reactions, metal chelation, and modulation of oxidative enzymes. Additionally, they serve as cofactors for antioxidant enzymes, enhancing the skin's defense mechanisms against oxidative stress. Studies have demonstrated that plant extracts can stimulate endogenous antioxidant enzymes such as catalase (CAT), superoxide dismutase (SOD), and glutathione peroxidase (GSH-PX), which play a crucial role in mitigating reactive oxygen species (ROS)-induced damage [454]. Plant-derived antioxidants, including polyphenols, tocopherols, carotenoids, and ascorbic acid, effectively neutralize free radicals, thereby promoting skin health [455]. Furthermore, research by Mabona and Van Vuuren [18] highlights the traditional use of Southern African medicinal plants in treating skin disorders, attributing their efficacy to bioactive compounds such as flavonoids, alkaloids, saponins, and phenolics, which possess anti-inflammatory, antimicrobial, and wound-healing properties. The therapeutic potential of herbal medicines in dermatology is well-documented, with numerous studies underscoring their effectiveness in managing skin conditions.

Vitale et al. [456] and Shubayr [457] emphasize that phytochemicals like flavonoids, alkaloids, and saponins enhance collagen synthesis, cell proliferation, and angiogenesis, accelerating wound

repair. Among the most studied botanicals, Aloe spp. Contain over 75 bioactive compounds, including vitamins (A, C, E, B12), enzymes (amylase, catalase, peroxidase), minerals (zinc, copper, selenium), polysaccharides (glucomannans, polymannans), and polyphenols (anthraquinones), all of which contribute to skin hydration, regeneration, and anti-inflammatory effects [456, 458]. Notably, Aloe polysaccharides show significant promise in tissue engineering due to their ability to promote cell proliferation and angiogenesis, making them valuable for regenerative medicine [459].

Psidium guajava is rich in photoprotective phenolics like flavonoids and tannins, without containing photosensitizing coumarins, making them suitable for sun protection [460]. Similarly, *Zingiber officinale* contains anthocyanins, which exhibit potent antioxidant and analgesic effects by inhibiting cyclooxygenases (COXs), lipoxygenases (LOXs), and nitric oxide synthase, thereby reducing skin inflammation and pain [461].

The root extract of *Kigelia africana* promotes wound healing through its glycosides (antimicrobial), phenolics/tannins (coagulation, antioxidant), and saponins (tissue repair). These compounds synergistically enhance inflammation control, cellular proliferation, collagen formation, and microbial defense, accelerating wound closure while preventing infection and oxidative damage, demonstrating their therapeutic potential in wound care [462, 463].

Venkataravana et al. [464] study identified key phytocompounds in *Citrullus lanatus* (flavonoids, terpenes, lycopene, resveratrol, lignans, tannins, and indoles) via GC-MS analysis. These compounds exhibit antioxidant, anti-inflammatory, and antimicrobial properties that support wound healing by enhancing angiogenesis, cell proliferation, and tissue remodeling, while also benefiting skin regeneration and managing inflammatory skin conditions [464].

Despite the promising pharmacological properties of these phytochemicals, further research is necessary to fully explore their mechanisms of action and validate their efficacy and safety in treating skin conditions. Given the complexity of plant-derived compounds, a thorough correlation between their phytochemistry and dermatological effects is essential. Therefore, consultation with healthcare professionals before using herbal remedies is strongly advised to ensure safe and practical application.

4. Conclusions

This review provides the first comprehensive synthesis of medicinal plants traditionally used in Zimbabwe for the treatment and management of skin conditions, drawing on both ethnobotanical data and pharmacological evidence. By identifying 93 plant species across diverse botanical families, the study reveals a rich, yet underexplored, pharmacopoeia rooted in indigenous knowledge systems. The findings underscore the significant role of traditional medicine in primary healthcare and emphasize the need for formal scientific validation of these plant-based therapies. In particular, the pharmacological profiles of many species demonstrating antimicrobial, anti-inflammatory, antioxidant, and wound-healing properties highlight their potential for developing affordable, culturally accepted treatments for common and chronic skin conditions. At the same time, toxicological assessments signal the importance of rigorous safety evaluation before wider clinical use. By consolidating scattered data and identifying priority species for further research, this study contributes meaningfully to the global discourse on ethnopharmacology and integrative dermatology. It also supports broader calls to preserve and promote indigenous health knowledge while guiding future pharmaceutical discovery efforts in Africa and beyond.

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Author Contributions

Elliot Nyagumbo, Trust Nyirenda, Cephas Mawere, Marvellous Matsheza: Conceptualization, writing – original draft, formal analysis, writing – review and editing. Elliot Nyagumbo, Cephas Mawere, Alfred M. Mutaramutswa, Donald T. Kapanga: Software, writing – review and editing. Elliot Nyagumbo, Cephas Mawere, Godwins Ngorima, Alfred M. Mutaramutswa: Methodology, writing – review and editing. Fabian Maunganidze, William Pote, Michael Bhebhe, Lucy Mabaya: Writing – original draft, writing – review and editing. All authors have read and approved the published version of the manuscript.

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The authors have declared that no competing interests exist.

Data Availability Statement

The data supporting this systematic review are from previously reported studies and datasets, which have been cited. The processed data are available from the corresponding author upon request.

Additional Materials

The following additional materials are uploaded at the page of this paper.

1. Table S1: Detailed search strategy for three database searches.

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