

Ethnobotanical survey of medicinal plants utilized for treating skin inflammation in the Robertson area, Western Cape, South Africa

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Abstract

Background

Skin inflammation remains a common dermatological condition affecting quality of life globally. In many South African communities, traditional medicine continues to serve as a primary healthcare resource. This study documents medicinal plants used for treating skin inflammation in the Robertson area of the Western Cape and evaluates associated ethnobotanical knowledge.

Methods

A qualitative ethnobotanical survey was conducted between March and June 2024 in Robertson, Western Cape. Thirty informants (28 males and 2 females) aged 18 years and above were selected through purposive and snowball sampling. Semi-structured interviews, which were pilot-tested before data collection, were conducted and lasted approximately 30–60 minutes. Data collected included plant species used, parts utilized, preparation methods, dosage, growth habits, and socio-demographic characteristics. Ethical clearance was granted by the Mangosuthu University of Technology Research Ethics Committee (REF: RD5/59/2024; approved 15 February 2024).

Results

A total of 30 plant species belonging to 22 families were documented. The dominant families were Asphodelaceae and Asteraceae (n = 3 each). Shrubs constituted the highest growth habit category (43.33%), followed by herbaceous plants (16.67%). Leaves were the most utilized plant part (60.98%). Infusion (35.14%) was the most frequently reported preparation method, followed by decoction and poultice (18.92% each). *Aloe ferox*, *Bulbine frutescens*, *Centella asiatica*, and *Gomphocarpus fruticosus* were the most cited species.

Conclusion

The findings illustrate the rich tradition of herbal medicine in the Robertson region and highlight the cultural significance of these indigenous plants in traditional therapeutic practices, emphasizing the need for conservation and further research on these species.

Recommendation

Preservation of this knowledge and conservation of plant species are crucial.

Keywords: Ethnobotany, Medicinal plants, Skin inflammation, Traditional medicine, Robertson, South Africa.

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Introduction

Medicinal plants are a remarkable resource for treating a diversity of human diseases and are currently the focus of modern research due to their vast biological and chemical diversity, which includes numerous compounds with significant biological activities (Yang et al. 2017). Advantageously, their cost-effectiveness, accessibility, and fewer side effects compared to traditional pharmaceuticals make herbal medicines crucial for validating their safety and efficacy, particularly in both

developed and developing countries, where medicinal plants often serve as a primary treatment source, particularly for treating inflammatory conditions (Bhattacharya 2017; Mutuma et al., 2020; Cooper and Ma, 2017). Numerous studies indicate that many people in developing countries rely on medicinal herbs as their primary source for treating inflammatory conditions (Hosseinzadeh et al., 2015; Mbendana et al., 2019). Several inflammatory diseases have been reported to be treated by secondary metabolites extracted from various parts of these plants (Gonfa et al., 2021). Furthermore,

extensive research is currently underway to examine natural products, particularly in relation to their anti-inflammatory properties (Taleb et al., 2016). A crucial issue in the field of medicine is skin disorders, which significantly affect the quality of life for many (Seth et al., 2017). According to the World Health Organization (WHO, 2019), a member of the World Health Organization indicated that over 88% involved in the use of traditional and complementary medicine (T&CM) practices. The incorporation of T&CM into health care systems is influenced by sociocultural, economic, and political contexts, and it requires establishing appropriate mechanisms and policy guidelines for their regulation, control, and monitoring. In dermatology, the role of ethnobotanical research is critical in documenting traditional medicinal practices, especially in areas like Robertson, where indigenous knowledge is essential. This study aims to catalogue the medicinal plants used in treating skin inflammation, emphasizing the cultural and pharmacological potential of local flora.

Materials and methods

Study area

The study was conducted in the Robertson area of the Western Cape Province, South Africa, between March and June 2024. This area is characterized by its hot, dry summers and cold, wet winters, with rich biodiversity providing a habitat for numerous medicinal plant species.

Study design

A semi-structured interview guide was created based on earlier ethnobotanical research. The interview guide was pilot tested with three people from a nearby community to ensure its clarity, relevance, and cultural appropriateness. The necessary changes were made before the main study began.

Data collection

Data were collected through both interviews and field observations, encompassing local names, preparation methods, and the cultural significance of medicinal plants. Each interview lasted approximately 30 to 60 minutes, depending on the depth of knowledge shared by the participant.

Ethical statement

Ethical approval was obtained from the Mangosuthu University of Technology Research Ethics Committee (REF: RD5/59/2024) on 15 February 2024. Written informed consent was obtained from all participants before data collection. Participants were informed of their right to withdraw at any stage.

Results and discussion

Demographic profile of informants

The demographic profile of informants was diverse, with participants' ages ranging from 18 to over 55 years, reflecting a wide spectrum of traditional knowledge. A total of 30 informants were interviewed; the analysis of the participants' age groups reveals a diverse representation (Table 1), with most informants falling within the 25-34 age group (N=10, 33.33%), followed closely by the 35-44 age group (N=7, 23.33%). Age group 45-54 contributed (N=6, 20.00%), following 18-24 age group, which contributed about (N=4, 13.33%). Lastly, the age group with the fewest informants is 55 and above, which contributed (N=3, 10.00%). Most participants had more than five years of experience in traditional medicinal practice. Knowledge transmission was primarily through ancestral inheritance and apprenticeship.

Table 1: Outlines the age distribution of informants, demonstrating significant representation across different age brackets.

Age group	Male	Female	Total	Percentages (%)
18-24	4	0	4	13.33%
25-34	9	1	10	33.33%
35-44	7	0	7	23.33%
45-54	6	0	6	20.00%
55 and above	2	1	3	10.00%
Total	28	2	30	100%

Medicinal plant diversity

Reported uses of various medicinal plants were compared to previously published scientific literature (Bautista-Hernández et al., 2021; de Rodríguez et al., 2019; Estrada-Castillón et al., 2021). A total of thirty plant species belonging to twenty-two families, which were mentioned to treat skin inflammation in the study region (Table 2), were identified and documented among the local herbalists, Rastafarians, informal doctors, and community elders. In the Robertson region of the Western Cape, the local informants highly identified four key plants, the most mentioned plant is *Aloe ferox* Mill, mentioned by exactly 30 (100%) informants, *Bulbine frutescens* (L.) Wild mentioned by 21 (70%) informants, *Centella asiatica* (L.) is mentioned by 18 (60%) informants, and lastly *Gomphocarpus fruticosus* (L.) Aiton F, mentioned by 17 (56.7%) informants. All other

remaining plants were mentioned but accounting less percentage.

Aloe ferox Mill, which is commonly known as Bitter aloë, is highly valued for its significant anti-inflammatory properties. Informants mentioned its effectiveness in treating a variety of skin conditions, including eczema, sunburn, blemished skin, psoriasis, and acne, with studies supporting its efficacy (Bonsignore et al., 2019). *Bulbine frutescens* (L.) Wild, also locally known as Balsemkopieva, is reported to be very effective against burns and general skin irritations (Van Wyk and Wink, 2015). *Centella asiatica* (L.), locally known as Varkooejies, is another plant highly recognized by informants for its positive outcomes on skin healing and reducing inflammation (Nasti et al., 2020). *Gomphocarpus fruticosus* (L.) Aiton f., or Tontelbos, is valued for its soothing effects on inflamed skin, although research associated with this plant is limited (Roux et al., 2017).

Table 2: Lists of these species along with preparation and application methods, indicating local herbal practices.

Family	Scientific name	Local name	Preparation	Part used	Habit
Amaryllidaceae	<i>Haemanthus coccineas</i> L.	Rooikat	PT	LE	BL
Apiaceae	<i>Arctopus echinatus</i> L.	Platdoring	TP	TR	PR
Apiaceae	<i>Centella asiatica</i> L.	Varkooetjies	IF	LE	HB
Apocynaceae	<i>Gomphocarpus fruticosus</i> (L.) Aiton f.	Tontelbos	IF	SE/LE	SH
Apocynaceae	<i>Cnanchum viminale</i> (L.) Bassi subsp.	Caustic bush	IF	RT/LT	CM
Asphodelaceae	<i>Aloe ferox</i> Mill.	Bitter aloë	TP	LE/RT	HB
Asphodelaceae	<i>Bulbine frutescens</i> (L.) Wild.	Balsemkopieva	PT	LE	SC
Asphodelaceae	<i>Gonialoe variegata</i> (L.) Boatwr. & J.C. Manning.	Bontalwyn	TP	LE	HB
Asteraceae	<i>Dicerotheramnus rhinocerotis</i> (L.f.) Koekemoer	Renosterbos	IF	SST	SH
Asteraceae	<i>Leysera gnaphalodes</i> (L.) L.	Hongertee	EL	LE	SH
Asteraceae	<i>Trachomatous camphoratus</i> (L.) L.	Vaalbos	IF/TT	LE/TW	TR
Ayoxoidaceae	<i>Hypoxis heme rocallidea</i> Fisch., C.A. Mey. & Ave-Lall.	Sterblom	IF/DC	RT/LE	BL
Ceassulaceae	<i>Cotyledon orbiculate</i> L.	Plakkie	PT	LE	SC
Dipsacaceae	<i>Scabiosa columbaria</i> L.	Bitterbos	BO	RT/LE	PR
Fabaceae	<i>Sutherlandia frutescens</i> (L.) R.Br.)	Kankerbos	TP/IF/DC	TW/LE	SH

Fabaceae	<i>Sutherlandia microphylla</i> (L.) R.Br.)	Bitterblaar	DC	LE	SH
Gentianaceae	<i>Chiromia baccifera</i> L.	Bitterbossie	IF	LE, RT, SST	SH
Lamiaceae	<i>Leonotis ocyimifolia</i> (Burm.f.) Iwarsson	Wildedagga	IF/DC	LE, SST	SH
Malvaceae	<i>Grewia robusta burch</i> L.	Karookruisbessie	PT	BR	TR
Malvaceae	<i>Hermannia</i> L.	Poprosie	IF	LE	SH
Melanthaceae	<i>Melianthus comosus</i> Vahl	Kruidjlie-roer-my-nie	PT	LE	SH
Menispermaceae	<i>Cissampelos capensis</i> L.f.	Dawidjieswortel	DC	RH	SH
Oleaceae	<i>Olea europaea</i> L. Subsp. African. (Mill.) P.S. Green.	Wild olive	IF	LE	TR
Onagraceae	<i>Oenothera biennis</i> L.	Evening primrose	LT/PT	LE/FL	HB
Oxalidaceae	<i>Oxalis pes-carprae</i> L.	Sorrel	PT	LE	HB
Portulacaceae	<i>Portulacaria afra</i> Jacq	Spekboom	CH	LE	SC
Ranunculaceae	<i>Climatis brachiata</i> Thunb	Old man's beard	IF	LE	CM
Sapindaceae	<i>Dodonaea viscosa</i> Jacq	Sandolien	PT	LE	SH
Solanaceae	<i>Withania somnifera</i> (L.) Dunal.	Geneesblaar bossie	IF/DC/TT	LE/RT	SH
Zygophyllaceae	<i>Tetraena retrofracta</i> (Thunb.) Beier & Thulin.	Hondepisbos	DC	LE/SST	SH

Preparation method: BO (Boiling), CH (Chewing), DC (Decoction), EL (Emollient), IF (Infusion), LT (Lotion), PT (Poultice), TP (Topically), TT (Tincture).

Part used: BR (Bark), LE (Leave), LT (Latex), RH (Rhizome), SE (Seed), SST (Small Stem), TR (Tree), TW (Twigs).
Habit: BL (Bulb), CM (Climber), HB (Herbaceous), PR (Perennial), SC (Succulent), SH (Shrub), TR (Tree).

Taxonomic families

The largest number of plant species originated from the families Aphodelaceae and Asteraceae, each with three plant species (n = 3). Followed by four families, Fabaceae, Apiaceae, Apocynaceae, (Figure 1) and Malvaceae, each accounting for two species (n = 2). Lastly, the remaining families, including Amaryllidaceae, Ayxoxidaceae, Crassulaceae, Dipsacaceae, Gentianaceae, Lamiaceae, Melianthaceae, Menispermaceae, Oleaceae, Onagraceae, Oxilidaceae, Portulacaceae, Ranunculaceae,

Sapindaceae, Solanaceae, and Zygophyllaceae, each have one species (n =1). Several studies have highlighted the high species representation of the Asteraceae, Asphodelaceae, and Fabaceae families amongst medicinal plants in Pakistan (Kayani et al., 2014; Ahmad et al., 2018), India (Lal et al., 2023), Iran (Naghbi et al., 2014), and Nepal (Kunwar et al., 2018). This trend is the same in South Africa, its neighbouring countries, and elsewhere in Africa (e.g., Asase et al., 2005; Wodah and Asase, 2012; Henry et al., 2013; Zizka et al., 2015; Tugume et al., 2016; Boadu and Asase, 2017; Appiah et al., 2019).

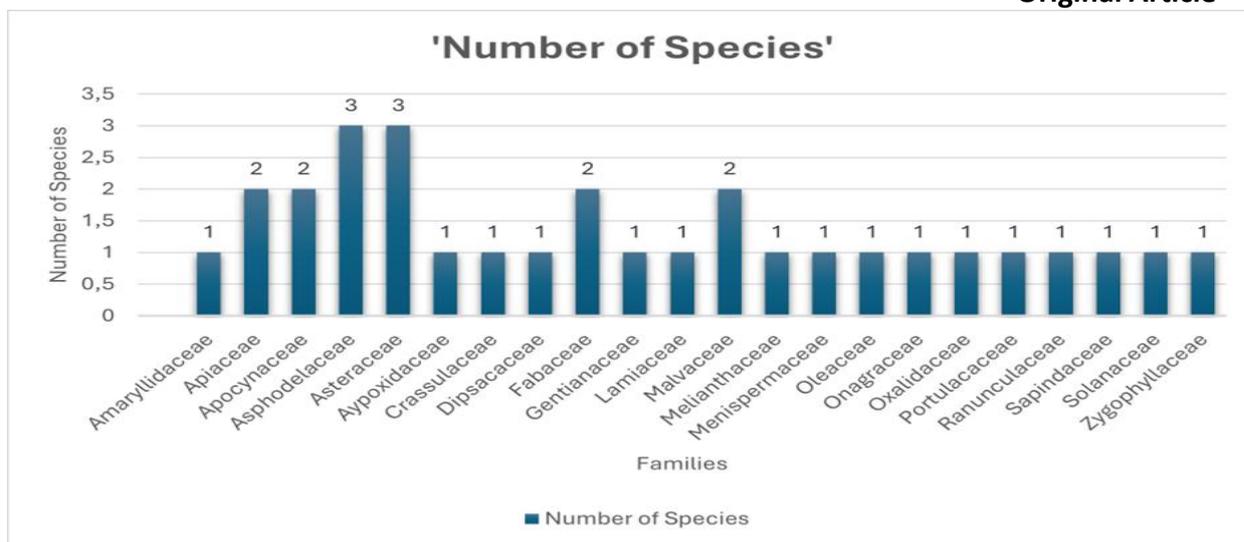


Figure 1: The largest number of species represented in each family

Preparation and administration methods

The most reported preparation method was infusion (35.14%), which involves soaking plant material in hot water before applying it topically (Figure 2). Decoctions (18.92%) were made by boiling harder plant components like roots and bark to extract bioactive chemicals. Poultices (18.92%) involve breaking fresh leaves into a paste and applying it directly to irritated skin. Topical

application of raw extracts accounted for 10.81%, especially for succulent species like *Aloe ferox*. Tinctures (5.41%) were made utilizing alcohol extraction for long-term preservation. Less popular ways were boiling (2.70%), chewing (2.70%), emollients (2.70%), and lotions (2.70%).

The prevalence of water-based extraction technologies shows that they are accessible, cost-effective, and safe in the community.

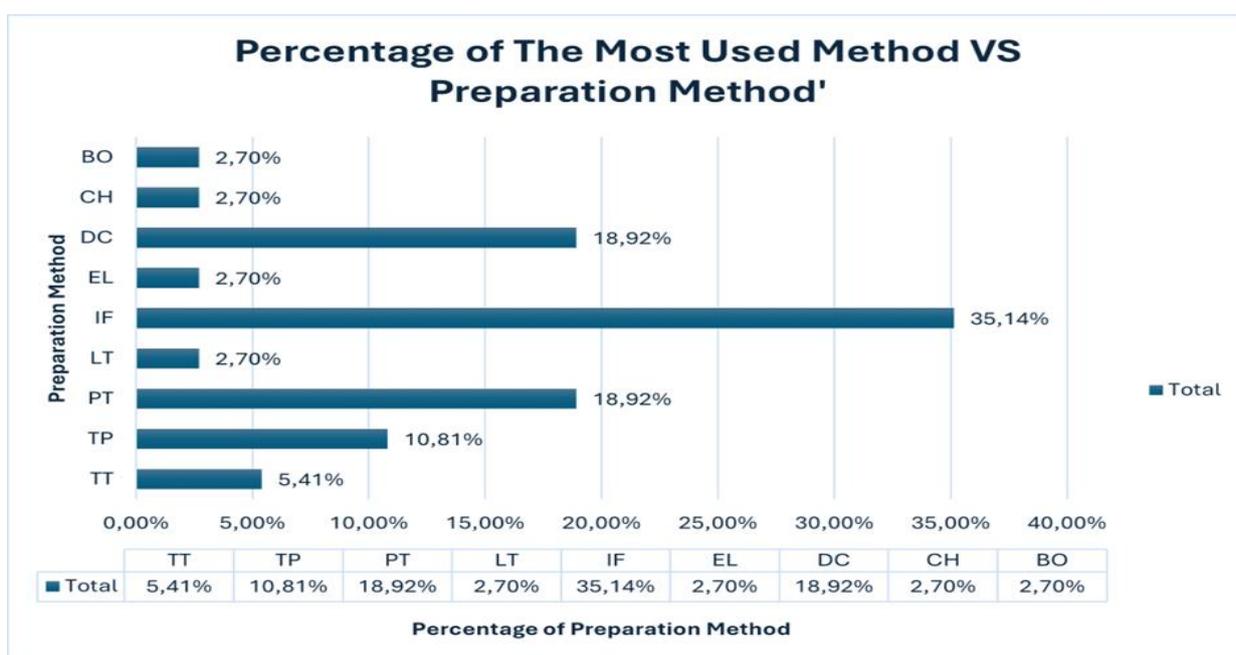


Figure 2: Most frequently reported preparation method.

(BO) Boiling, CH (Chewing), DC (Decoction), EL (Emollient), IF (Infusion), LT (Lotion), PT (Poultice), TP (Topically), TT (Tincture).

Plants parts used

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According to informants, leaves are the most used part of the medicinal plants, accounting for about 60.98% due to their effectiveness and accessibility (Tuttolomondo et al., 2014; Lal et al., 2023) (Figure 3); this is consistent with existing literature (Wodah and Asase, 2012; Zizka et al., 2015; Appiah et al., 2019; Lal et al., 2023). Roots and small stems come second, each accounting for 9.76% of total usage, according to informants. Roots are significant and less utilized due to extraction difficulties, lower availability, or the potential for toxicity (Kayani et

al., 2014; Boadu and Asase, 2017; Kunwar et al., 2018). Twigs are also used, accounting for 4.88%, but their proportion is relatively low due to specific applications that are not as prevalent as leaves or roots. The usage of taproot, seeds, flower, latex, bark, and rhizome is relatively even lower, with each component making up to 2.44%, indicating that these specific parts have limited medicinal properties for skin inflammation when compared to the mostly utilized parts of the plant. The results of this study were like those reported by Pizon et al. (2016), Tindowen et al. (2017), and Morilla and Demayo (2019).

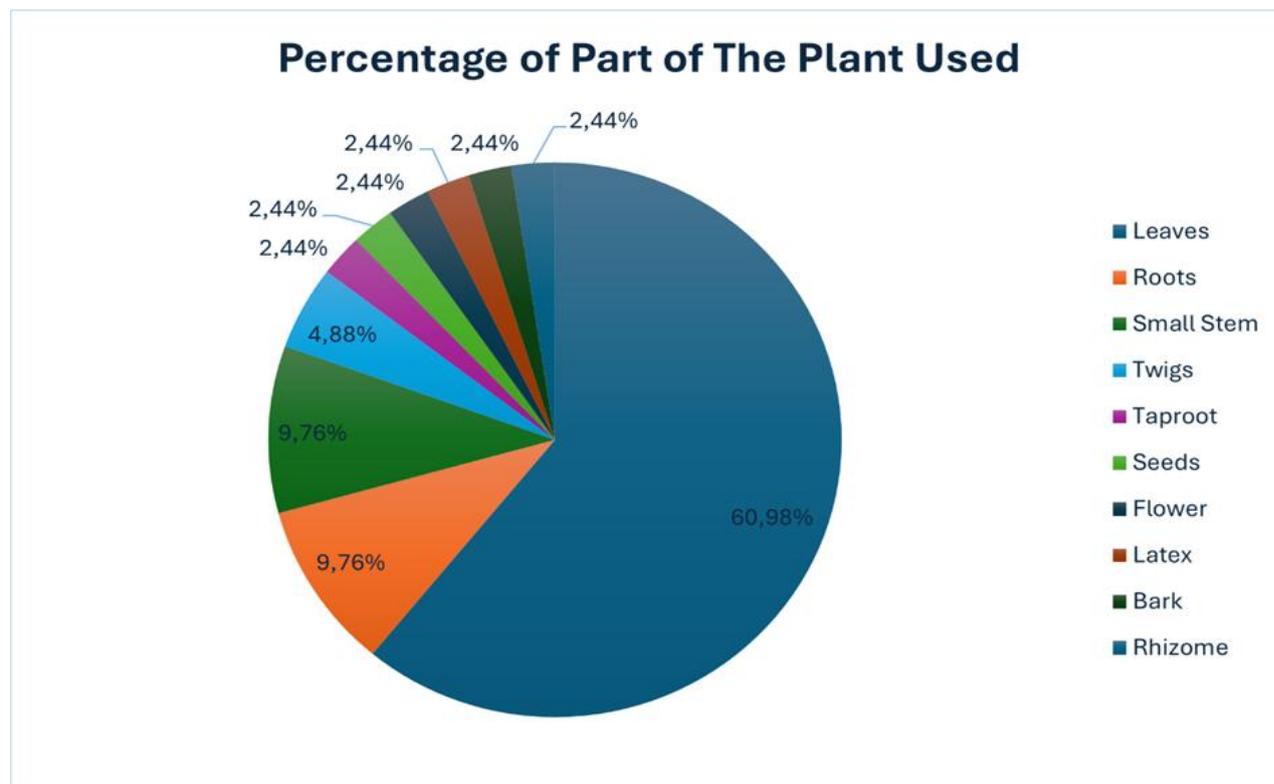


Figure 3: Most frequently utilized plant parts in medicinal applications

Habit

Shrubs were the most represented growth habit (43.33%), showing their ecological dominance and accessibility.

Herbaceous species accounted for 16.67%, while succulents and trees each contributed 10%. Climbers, bulbs, and perennials each contributed 6.67% (Figure 4). The prevalence of bushes may reflect their tolerance to the semi-arid Robertson environment.

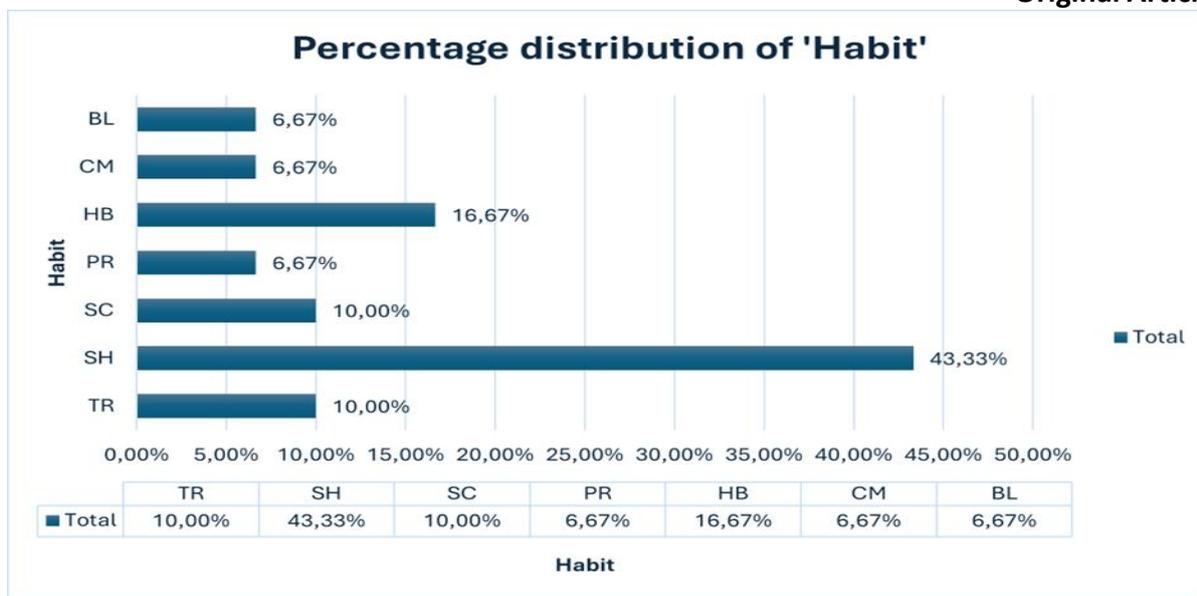


Figure 4: Distribution of growth habits of plant species utilised for treating skin inflammation.

Habit: BL (Bulb), CM (Climber), HB (Herbaceous), PR (Perennial), SC (Succulent), SH (Shrub), TR (Tree).

Dosage and duration of treatment

As mentioned by the informants, the dosage depends on the patient's condition and varies depending on the specific plants used and the ailment being treated. Key factors should be considered when determining an appropriate dosage for older and younger patients, as these age groups can be more sensitive to certain compounds, along with their overall health and body strength. Caution should be exercised with pregnant women, as some herbs may pose complications. Duration often depends on the severity of the skin condition and specific herbs used, and certain conditions may require daily application based on the patient's response.

The study's findings provide useful insights into traditional medicinal practices in Robertson; however, its applicability may be limited to communities with similar socio-cultural and ecological environments in the Western Cape. Differences in biodiversity, cultural attitudes, and healthcare access may have an impact on plant usage habits in other regions.

Conclusion

The ethnobotanical survey highlights the importance of medicinal plants in traditional healthcare systems within the Robertson area, affirming the role of cultural

practices in the utilization of local flora. This research contributes significantly to the preservation of traditional knowledge and underscores the necessity of conservation efforts in the face of modernization.

Limitations

Throughout the study, informants reported challenges related to the generational shift towards modern medicine, climate change impacts, and regulatory restrictions affecting access to traditional knowledge. In addition, this study was restricted by its small sample size (n = 30) and gender imbalance among participants. The dependence on self-reported data may result in recollection bias. Furthermore, the pharmacological confirmation of the recorded plants fell outside the scope of this investigation.

Recommendations

Additional pharmacological and toxicological research is needed to properly validate the anti-inflammatory capabilities of the identified plant species. Conservation techniques must be implemented to protect overharvested species. Future research should use bigger, gender-balanced samples to improve representativeness.

conservation management, sustainable resource use, and community-based natural resource management.

List of abbreviations

BO – Boiling
CH – Chewing
DC – Decoction
EL – Emollient
HB – Herbaceous
IF – Infusion
LT – Lotion
PT – Poultice
SC – Succulent
SH – Shrub
TP – Topical application
TT – Tincture
WHO – World Health Organization

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Conflict of interest

The authors declare no conflict of interest.

Author contributions

N.C. Mitileni: Conceptualization, data collection, data analysis, manuscript drafting.

K. Singh: Supervision, methodology development, critical review, editing, and final approval of the manuscript.

Data availability

The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Author biography

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Original Article

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