# Medicinal plants used for dermatological disorders among the Nyamwezi community in Tabora region, Tanzania

David Sylvester Kacholi

**Correspondence**

**David Sylvester Kacholi**

Department of Biological Sciences, Dar es Salaam University College of Education (DUCE), University of Dar es Salaam (UDSM), P. O. Box 2329 Dar es Salaam, Tanzania

*Corresponding Author: kacholi78@gmail.com or david.kacholi@udsm.ac.tz

**Ethnobotany Research and Applications 28:50 (2024)** - http://dx.doi.org/10.32859/era.28.50.1-22
Manuscript received: 21/12/2023 - Revised manuscript received: 09/03/2024 - Published: 10/03/2024

## Research

## Abstract

*Background:* Dermatological disorders (DDs) are a significant public health concern worldwide as they are considerably affecting the quality of human health and problematic to cure due to persistence. This study aimed to census the traditional medicinal plants (TMPs) used to treat DDs in the Tabora region, Tanzania.

*Methods:* Semi-structured interviews were conducted to collect information from traditional healers (THs). The emphasis was on local plant names, cured DDs, plant parts used, preparation, and administration of remedies. Quantitative approaches, including family importance value (FIV), species use value (SUV), plant part value (PPV), Jaccard index of similarity (JI), and informant consensus factor (ICF), were calculated too.

*Results:* Sixty-four TMPs from 32 families were recorded for treating 14 DDs. The dominant family and life form were Fabaceae (with 20.3% of all TMPs and FIV of 3.455) and tree (50%), respectively. The preferred mode of utilisation and route of administration were crushing (28.1%) and topical (67.2%), respectively, while leaf (PPV = 2.86) was the most utilised plant part. The TMP with the highest SUV (0.818) was *Bidens Pilosa* L. (Asteraceae). A significant number of TMPs (42.2%) were used for wound healing. The highest ICF was recorded for ringworms (0.972) and the least for sores (0.924). The maximum similarity (JI = 8.3) was with the study from South Africa.

*Conclusion:* The study exposed the significance of TMPs used by the THs of the Tabora region against DDs. To offer an understanding of each plant's anti-infective role, an investigation to authenticate the therapeutic potential of the recorded TMPs is underway. This study suggests a need to create awareness among locals and other stakeholders for conserving TMPs and indigenous knowledge in the region and the country at large.

*Keywords:* Skin disorders, ethnomedicine, medicinal plants, quantitative indices, traditional knowledge, wound healing

## Background

Globally, dermatological disorders (DDs) are a significant public health concern in the developed and developing world as they affect the quality of life and health and cause economic burdens to societies (Mengist Dessie *et al.* 2022, Urban *et al.* 2021). The DDs are exceedingly widespread and one of the utmost contributors to ailment morbidity in the biosphere. In

2013, DDs were the fourth major cause of non-fatal ailments globally and classified as the eighteenth topmost contributor to illness burden (Giesey *et al.* 2021, Karimkhani *et al.* 2017). They are ubiquitous in tropical countries and are known to affect individuals of all age groups and gender (Grice *et al.* 2009). The DDs have gained consideration in recent decades due to their close association with HIV/AIDS. This is because about 96% of HIV/AIDS-infected patients develop skin and mucosal problems at some point of the ailment (Halder *et al.* 2012). The DDs such as ringworms, wounds, boils, eczema, itching, abscesses, warts, leprosy, skin allergy swelling, dermatitis, fungal diseases, scabies, and inflammation are the largest group of skin-related disorders that occur in most countries. Most TMPs used for managing DDs have been identified with supplementary properties, such as antimicrobial, antibacterial, anti-inflammatory, antiviral and anti-analgesic effects, underscoring the requirement for pharmacological validation (Palchetti *et al.* 2023).

Ethnobotanical studies revealed that TMP remedies are an alternative therapy for managing and controlling various ailments, including DDs (De Wet *et al.* 2013, Malik *et al.* 2022). The remedies have many valuable advantages, including notable efficacy, minimal side effects, and cost-effectiveness compared to modern medications (Adane *et al.* 2020, Alkhamaiseh & Aljofan 2020, Ekor 2014). In Africa, TMPs play a pivotal role in managing DDs and related conditions, particularly in rural communities (Asong *et al.* 2019, Oyedemi *et al.* 2018, Wanga & Nyamboki 2023). The widespread utilisation of TMPs by most rural residents is due to inadequate modern health facilities, insufficient medicines and other supplies, low purchasing power due to poverty, socio-cultural beliefs and the fact that TMPs have wide cultural acceptance in rural settings (Chinsembu 2016, Mathibela *et al.* 2019, Tugume *et al.* 2019). Presently, the scientific world has an unfathomable interest in the documentation of TMP knowledge from different parts of the world (Boadu & Asase 2017, Cordero *et al.* 2022, Mahwasane *et al.* 2013, Tahir *et al.* 2021), including those used for the management of DDs (Asong *et al.* 2019, Njoroge & Bussmann 2007, Saising *et al.* 2022). The government of the United Republic of Tanzania, through the Ministry of Health, is promoting the use of therapeutic herbal remedies to improve the health of its citizens (Mujinja & Saronga 2022).

In Tanzania, the prevalence of DDs in rural areas of Tanzania is 34%, with the majority of disorders being curable and preventable (Satimia *et al.* 1998), and more than 80% of the rural residents rely on TMPs for their primary healthcare needs (Kacholi & Amir 2022a) including treating DDs. The therapeutic plants used for managing skin disorders are documented in ethnobotanical studies that are very general. Still, no specific ethnomedicinal study has explicitly researched the usage of TMPs in treating DDs in the country. Therefore, this study aims to document and examine the diversity of TMPs utilised by the Nyamwezi THs for treating DDs in the Tabora region. The findings of this study will enable the conservation of the traditional knowledge use of recorded TMPs in the management of DDs and future scientific validation of the TMPs through antimicrobial, pharmacological and phytochemical studies.

## Materials and Methods

**Description of the study area**

This study was conducted in two Districts, namely Urambo and Sikonge Districts of the Tabora region. Sikonge District is situated in the southern part of the region at latitudes 05°15’ to 06° 45’S and Longitude 32° 15’ to 33° 45’E at an altitude of 1300 m above sea level. Uyui District borders it to the north, Manyoni District to the east, Urambo District to the northwest, Chunya District to the South, and Mlele District to the southwest. The district has 17 wards, but only four were involved in this study: Ipole, Tutuo, Mpombwe, and Igigwa. Urambo District is located in the mid-west of the Tabora region at latitude 04° 41' to 05° 44’ S and longitudes 31°51’to 32°26 E at an altitude of 1000 and 1800 meters above the mean sea level. The district is bordered by the Kaliua District in the north, Sikonge District in the southeast, Uyui District in the east, and Mlele District in the southwest. Urambo District has 16 wards, but three wards, namely Nsenda, Muungano and Usisya, were involved in the survey (Figure 1). Both districts cover nearly 43.7% of the Tabora region area and possess 20% of the region's human population, with an average growth rate of 2.9% per annum. The climate of the two Districts is bimodal, with the rainy season from November to April and the dry season from May to October. The minimum and maximum temperatures are 17℃ and 29℃, respectively. The region's residents are the Nyamwezi ethnic group, who rely on agriculture and livestock keeping for their livelihood (Kacholi & Amir 2022b).

**Ethnobotanical data collection**

The fieldwork was conducted from April to August 2021 in Urambo and Sikonge Districts of the Tabora region. A snowballing sampling technique was used to get the THs in the two districts. A total of 44 THs (three from Mpombwe, five from Igigwa, six from Ipole and nine from Tutuo ward in Sikonge District; eleven from Nsenda, six from Muungano, and four from Usisya ward in Urambo District) were cross-examined after getting their prior informed consent. During the field surveys, head-on interviews using semi-structured questionnaires were conducted. Guided field walks were conducted, too.

The questionnaire used had two sections. The first section focused on the demographic data of the THs, including gender, age, education level, experience in the traditional healing sector and marital status, while the second section focused on information about TMPs´ local names, part of the plant used for remedy formulation, mode of preparation, and route of administration of remedies. All collected information was evaluated and organised using quantitative analysis. In the present study, TMPs were identified with the help of an experienced botanist, from the Forest and Beekeeping Division of the region. All the TMPs were further verified using the available literature and compared with the herbarium specimens at the University Herbarium. The botanical names and origin of TMPs were further confirmed using the Plants of the World Online (https://powo.science.kew.org/) database. This study was conducted in accordance with the International Society of Ethnobiology (ISE) Code of Ethics (http://ethnobiology.net/code-of-ethics/).

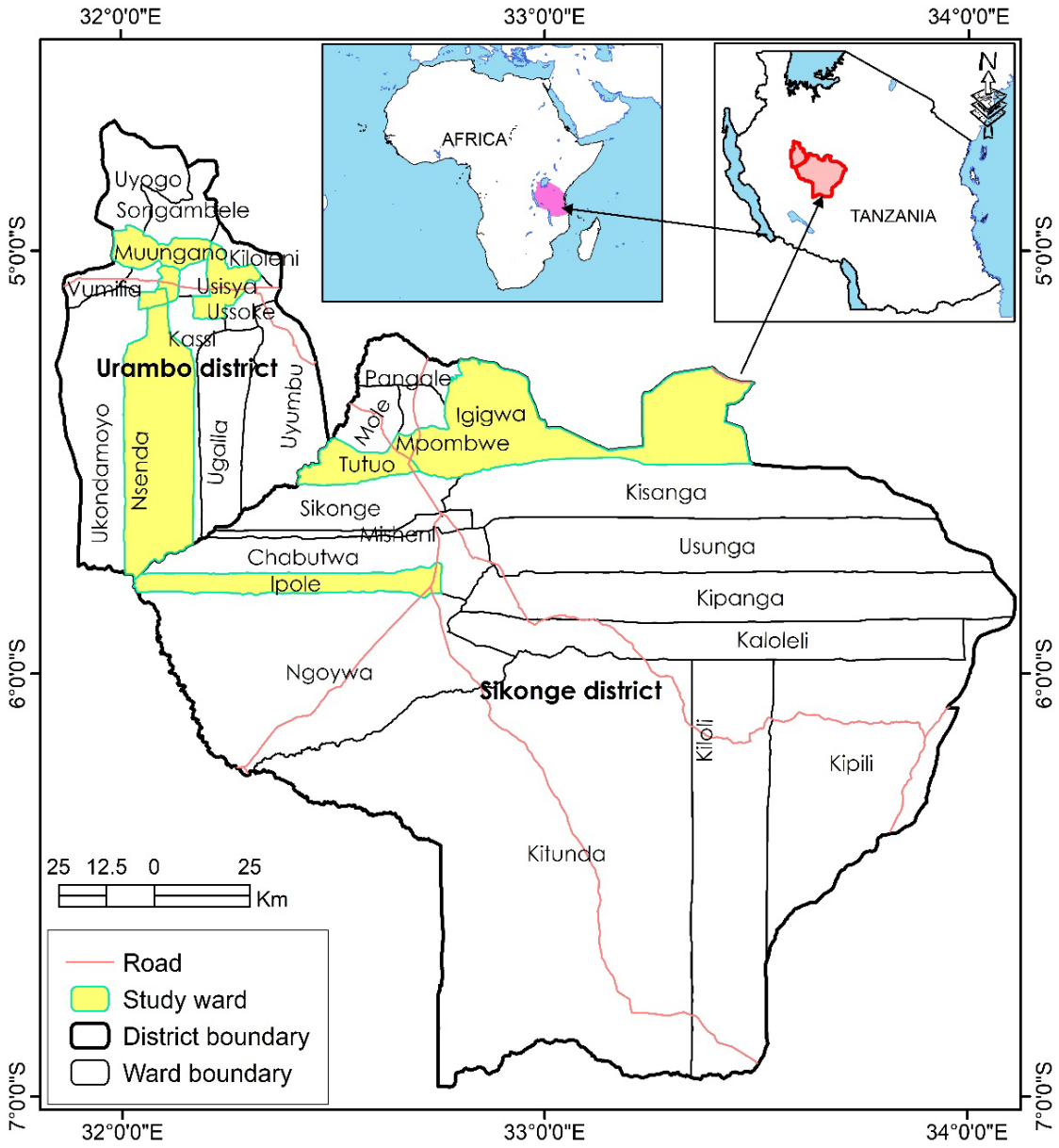


Figure 1. Map showing the study areas, the settings of the districts in the country and the country in Africa

**Research clearance and ethical approval**

The Office of the Vice Chancellor of the University of Dar es Salaam granted the research clearance to undertake this study as per powers given by the University Act.

**Quantitative data analysis**

***Demographic profile of respondents***

The socio-demographic data were descriptively analysed using the Microsoft Excel 2010 software and presented in a tabular form.

***Family importance value (FIV)***

The family importance value (FIV) is a quantitative measure that analyses the importance of the botanical family. It was calculated using the following formula (Afzal *et al.* 2021).

$$FIV = \frac{fc}{N}\ x\ 100 \qquad (1)$$

Where fc is the number of informants reporting the family, and N is the total number of informants involved in the study.

***Species Use value***

The species use value (SUV) index determines the relative importance of each TMP used for managing disorders (Zenderland *et al.* 2019). It is calculated using the formula shown below.

$$SUV = \frac{\sum U_i}{N} \qquad (2)$$

Where $U_i$ represents the number of different uses cited by each informant for a given TMP and $N$ refers to the total number of informants interviewed for a particular TMP.

***Plant part value (PPV)***

The plant part value (PPV) index recognises the most preferred plant part in a remedy formulation. The plant part with the highest PPV is the most utilised by the locals for remedy formulation compared to those with low values (Chaachouay *et al.* 2019). The index was calculated using the formula below.

$$PPV = \frac{\sum RU_{(plant\ part)}}{\sum RU} \qquad (3)$$

Where RU refers to the sum of uses cited per plant part, and RU represents the number of use reports of all TMPs.

***Informant consensus factor ratio (ICF)***

The Informant consensus factor (ICF) is the commonly used quantitative method for recognising the potentially effective TMP in a particular ailment category. Usually, the ICF values range from 0.00 to 1.00. The high ICF values suggest pharmacologically active TMPs than those with low values (Heinrich *et al.* 2018). The index was calculated using the following formula;

$$ICF = \frac{N_{ur} - N_t}{N_{ur} - 1} \qquad (4)$$

Where $N_{ur}$ is the number of use reports for a particular ailment category, and $N_t$ is the total number of MPs cited by informants in the ailment category.

***Jaccard index (JI)***

The Jaccard index (JI) was calculated to compare the similarity of TMPs between the present study and other published ethnobotanical studies on DDs from African countries and elsewhere. This index is based on the presence or absence of species on each list and was calculated as follows (Iragi *et al.* 2021).

$$JI = \frac{c\ x\ 100}{a + b + c} \qquad (5)$$

Where $a$ refers to the total number of TMPs of the present study, $b$ is the total number of TMPs of another ethnomedicinal study, and $c$ represents the number of TMPs common to both studies.

**Conservation status (CS)**

The conservation status for each recorded TMP was assessed as per the International Union for Conservation and Nature (IUCN) Red List categories of 2022 (IUCN 2022).

## Results and Discussion

**Socio-demographic profile of traditional healers**

A total of 44 THs from two districts, Sikonge (23) and Urambo (21) were involved in the survey. The majority of THs were males (75.0%). Based on age, the THs were divided into four categories (Table 1), whereby the majority belonged to the 41-50 age group (47.7%), followed by those with greater than 50 years (25.0%). Regarding education level, 56.8% had primary education, 31.8% were illiterate, and 11.4% had secondary education. In terms of experience, 68.1% of the THs had more than eleven years of experience in the sector. Most THs (54.5%) were married, followed by single (29.5%), widowed (11.4%) and divorced (4.5%).

Like this study, gender disproportionality in the traditional healing sector was also reported in other related studies in the Mwanza region, Tanzania (Sundararajan *et al.* 2023), Uganda (Uwimbabazi *et al.* 2023) and Zambia (Chinsembu 2016). In Africa, men are more trusted than females in the traditional healing sector. Usually, THs pass their knowledge to the first son in the family as part of the inheritance of the culture. Moreover, it was evident that the young generation is less involved in traditional healing enterprises in the region, possibly because parents are not transferring the indigenous knowledge to the young generation, youths are disinterested in the sector, or youths are encouraged to pursue formal or modern healing industry, which is financially worthwhile. Similarly, the decline of traditional healing knowledge among young generations has been reported in other ethnobotanical studies in Brazil (Miguéis *et al.* 2019), Nigeria (Olanipekun 2023) and Indonesia (Wiryono *et al.* 2019).

Table 1: Demographic data of traditional healers involved in the survey

| Parameter | Category | Participant (N) | % N |
|---|---|---|---|
| Gender | Male | 33 | 75.0 |
| | Female | 11 | 25.0 |
| Age (years) | 21-30 | 5 | 11.4 |
| | 31-40 | 7 | 15.9 |
| | 41-50 | 21 | 47.7 |
| | > 50 | 11 | 25.0 |
| Education levels | None | 14 | 31.8 |
| | Primary | 25 | 56.8 |
| | Secondary | 5 | 11.4 |
| Experience (years) | Less than 5 | 4 | 9.1 |
| | 5 - 10 | 10 | 22.7 |
| | 11 - 15 | 17 | 38.6 |
| | Above 15 | 13 | 29.5 |
| Marital status | Single | 13 | 29.5 |
| | Married | 24 | 54.5 |
| | Widow | 5 | 11.4 |
| | Divorced | 2 | 4.5 |

**Source of traditional knowledge**

Most THs (65.9%) claimed to have acquired indigenous knowledge about traditional medicine from family members such as parents, grandparents, and other close relatives. Other THs described to have developed the healing ability from ancestor spirits (13.6%), followed by friends (9.1%), THs and herbalists (6.8%) and self-training through reading different books (4.6%). Similar reports on the dominance of ethnomedicinal knowledge transfer from family members were also reported in other studies (Gessler *et al.* 1995, Kamanja *et al.* 2015, Uwimbabazi *et al.* 2023).

**Medicinal Plants diversity**

This study reports the ethnomedicinal uses of 64 TMPs representing 57 genera and 32 botanical families, which locals use for treating various DD and related conditions in the Tabora region (Table 2). Fabaceae (with 13 TMPs, 20.3%) was the dominant family, followed by Combretaceae and Lamiaceae (with 4 TMPs, 6.3% each). The remaining families had less than four TMPs (Table 3). Similar ethnobotanical studies conducted in northern Maputaland, South Africa (De Wet *et al.* 2013), northern Delta State, Nigeria (Enebeli-Ekwutoziam *et al.* 2021) and Kenya (Wanga & Nyamboki 2023) revealed that most TMPs used for managing DD belong to the Fabaceae family. The comparatively high number of TMPs reported to treat DDs suggests high floral diversity and rich indigenous knowledge in the study area.

**Life forms and sources of medicinal plants**

The analysis of plant life forms for the reported TMPs revealed that trees constituted a significant proportion (50%), followed by herbs (27%) and shrubs (23) (Figure 3). This study finding is consistent with habitats of TMPs from other studies on a similar topic (Saising *et al.* 2022). The dominant use of trees could be influenced by the region's tropical climate that upholds the growth of a wide variety of trees (Sikuku *et al.* 2023) and the ethnobotanical familiarity of the life form (Kacholi *et al.* 2023). Moreover, the preference could be related to availability and accessibility as they do not depend on seasonality. Among the documented TMPs, 75% are native, and 25% are introduced species (Table 2).

Of the recorded TMPs, 56.6% (36 TMPs) are obtained from the wild areas, 21. 9% are from cultivated areas, and the remaining 21.9% are from wild and cultivation areas (Figure 2). The dependency on wild resources is attributed to their free accessibility, as no permits required for gathering the plant materials. On the other hand, TMP users tend to think that cultivated plants could be inefficient compared to wild ones, hence relying on wild resources. Therefore, to protect wild resources from overexploitation and for sustainable supply, ex-situ cultivation of TMPs is highly recommended as a conservation approach and means of reducing the harvesting pressure of wild resources. The strategy is crucial for promoting future access to TMP remedies to uphold the primary health care system in rural areas and offering raw materials for discovering new drugs using modern science and technology.

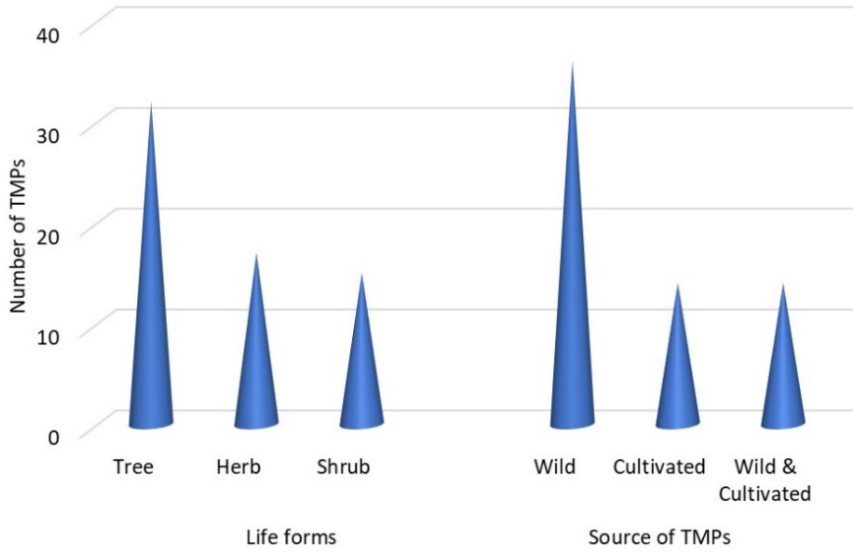


Figure 2. Life forms of the medicinal plants used to manage dermatological disorders

**Plant parts used, preparation and administration**

The specific plant part(s) of each TMP used to manage DDs were carefully recorded (Table 2). The plant part value index (PPV) is commonly used in ethnobotany to understand the principal plant part used for medicinal formulations in an area. In the present study, leaf was the most preferred plant part with a PPV of 2.86, followed by root (1.64) and bark (1.14). The remaining parts had a PPV of less than one (Figure 3). Leaves are also reported in other ethnobotanical studies in Kenya (Wanga & Nyamboki 2023), South Africa (De Wet *et al.* 2013), Thailand (Saising *et al.* 2022), and Pakistan (Malik *et al.* 2019) as frequently and the preferred plant part used to formulate remedies for managing DDs. The preference utilisation of leaves could be associated with their availability and ease of harvest compared to other plant parts. Also, the part is well known for easy preparation and synthesis of abundant bioactive constituents (Neamsuvan *et al.* 2018). Moreover, using leaves is advocated as they have little detrimental impact on the parent plants compared to roots and bark. It was also noted that

various plant parts of the same TMP could be used, for instance, Bark and leaves of *Lannea schweinfurthii* (Engl.) Engl. (Anacardiaceae), roots and leaves of *Acalypha fruticosa* Forssk. (Euphorbiaceae) and *Suregada zanzibariensis* Baill. (Euphorbiaceae) are used to manage skin rashes.

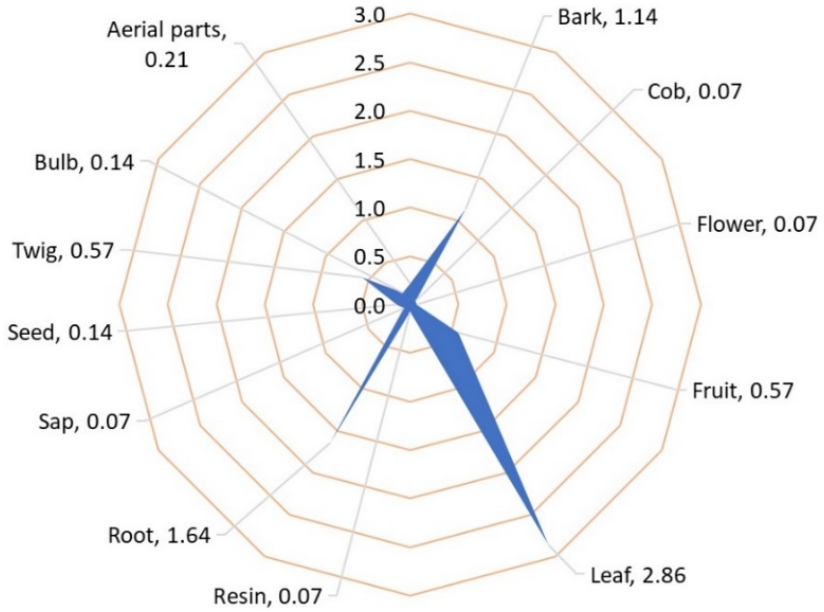


Figure 3. Radar diagram showing plant part values (PPV) for each medicinal plant part

Most remedies for treating DDs were prepared in various ways (Table 2 and Figure 4). The collected plant materials were used in either a fresh or dry form. Crushing (28.1%), followed by powdering (23.4%) and decoction (20.3%), were the preferred modes of preparation of most remedies. The administration of remedies was mainly applied topically (67.2%) as a paste, ointment, powder, sap, smear or infusion on the affected skin area, followed by oral (26.6%) and enema (6.2%). The use of enema for remedies administration was chiefly done for managing sores. According to THs, the use of enemas is believed to eradicate the problems alleged to originate from inside the body. In most cases, the enema was simultaneously applied with decoctions for the same reason: to treat the disorder from inside the body. Comparable to the findings of this study, the dominant modes of preparation (i.e., crushing, powdering and decoction) and routes of administration (topical application such as paste, enemas, ointment, smearing) of remedies were also reported in other ethnobotanical studies being frequently utilised for treating skin related disorders (De Wet *et al.* 2013, Malik *et al.* 2019, Wanga & Nyamboki 2023).

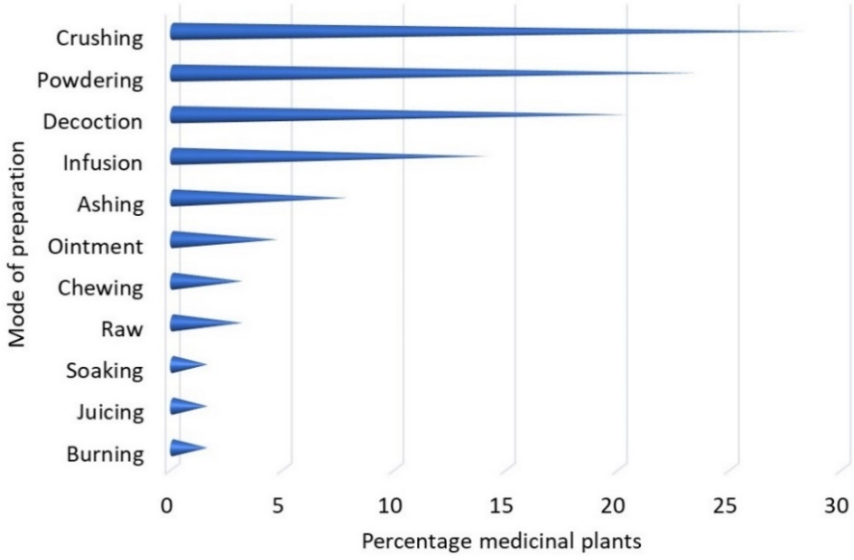


Figure 4. Mode of preparation of medicinal plants used for dermatological disorders

**Dermatological disorders treated by medicinal plants**

This study categorised the DDs into 14 groups (figure 5). A significant number of TMPs were used to manage wounds (42.2%, 27 species), followed by abscesses (20.3%, 13 species), sores (17.2%, 11 species) and skin rashes (10.9%, 9 species). Other ten important DDs treated by TMPs in the region are shown in Figure 5 below. Measles, pimples, warts and acne were reported to be managed by only one TMP each. Like this study's findings, the survey conducted in Kenya (Njoroge & Bussmann 2007), Pakistan (Malik *et al.* 2019) and South Africa (De Wet *et al.* 2013) reported wounds, abscesses, and sores to be treated by a good number of TMPs than other disorders.

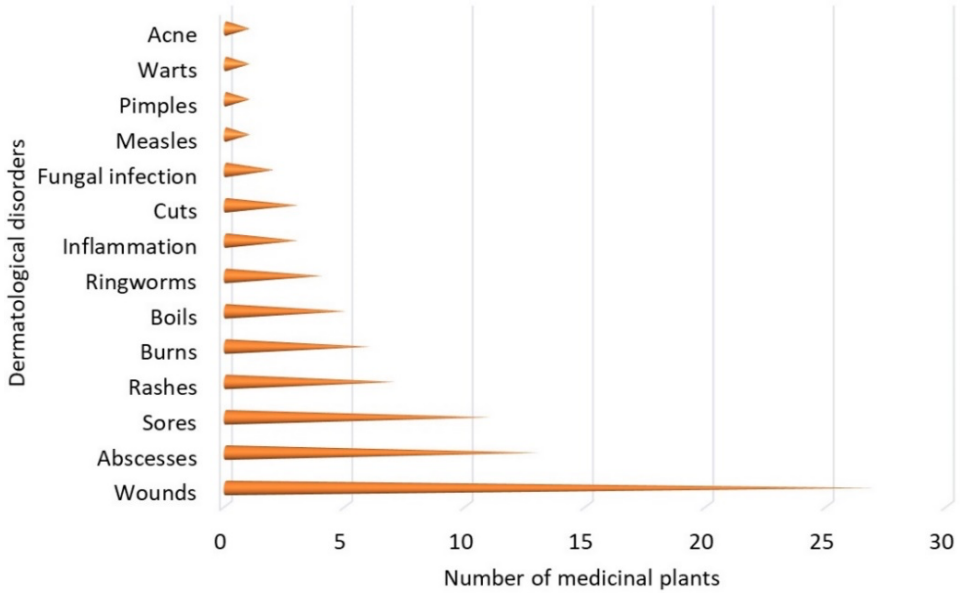


Figure 5. Categories of dermatological disorders and number of medicinal plants used for management

**Quantitative analysis**

***Family importance value (FIV)***

The family importance values (FIV) ranged from 0.091 to 3.455. Fabaceae had the highest FIV value (3.455), followed by Lamiaceae (1.386), Curcubitaceae (1.341), Euphorbiaceae (1.250) and Amaryllidaceae (1.182), hence, considered the most important families in the region (Table 2). The dominance of Fabaceae was also reported in other ethnomedicinal studies conducted in the region (Kacholi & Amir 2022b, 2022c) and other African countries, such as South Africa (Maema *et al.* 2019), Ethiopia (Tahir *et al.* 2021) and Zimbabwe (Maroyi 2013). The supremacy of the family in treating DDs could be associated with its prosperity in terms of TMPs in the region and the knowledge of the locals in utilising the family for medicinal purposes (Kacholi & Amir 2022a, 2023). Other important families reported in this study, such as Lamiaceae, Euphorbiaceae, Asteraceae, Amaryllidaceae and Curcubitaceae, have been reported in other ethnomedicinal surveys to contain TMPs with therapeutic potential. In addition, the low FIV unveiled by some botanical families, such as Opiliaceae and Moraceae (0.091 each), Burseraceae (0.114), as well as Musaceae and Amaranthaceae with 0.182 each, might suggest less accessibility of their TMPs in the region and perhaps low knowledge among the Nyamwezi people in utilising these families for DDs management. Hence, they should not be ignored by future researchers in the search for new drugs against DDs.

***Species use value (SUV)***

The species use value (SUV) determines the relative importance of the use of TMPs in a particular region (Al-Robai *et al.* 2022). In the present study, the most valuable TMPs were *B. pilosa* L. with SUV of 0.818, followed by *Momordica charantia* L. (Cucurbitaceae) with SUV of 0.773, *Euphorbia hirta* L. (Euphorbiaceae) (0.750), *Psidium guajava* L. (Myrtaceae) (0.727), as well as *Abelmoschus esculentus* (L.) Moench (Malvaceae), and *Aloe vera* (L.) Burm.f. (Asphodelaceae) with SUV of 0.705 each (Table 2). Of the recorded TMPs, 67.2% showed a moderate use value index (0.205 to 0.659), and the most minor use value (SUV < 0.200) was scored by 23.4% of the reported TMPs. TMPs with high SUVs are known to have rich bioactive ingredients, making them popular therapeutic plants. In that view, scrutinising and exploring their phytochemical and pharmacological potential is imperative for identifying their bioactive compounds and discovering up-to-date drugs. Similarly, TMPs with high SUVs should be prioritised for conservation as their preferential consumption may compromise their existence due to overexploitation. The low SUV exhibited by some TMPs could be due to their less abundance in the study area or unfamiliarity by the THs for the DDs treatment.

Table 2. Medicinal plants used to manage dermatological disorders in Tabora region, Tanzania

| Family/Scientific Name (Voucher No.) | Vernacular name | LF | HA | PU | OR | Ailment cured | Preparation and Administration | SUV | CS | FIV |
|---|---|---|---|---|---|---|---|---|---|---|
| **Amaranthaceae** | | | | | | | | | | 0.182 |
| *Cyathula orthacantha* (Hochst. ex Asch.) Schinz (TB04) | Ilamata | H | W | L | N | Wounds | Leaves are dried and pounded, mixed with pounded castor oil seeds and applied to wounds daily | 0.182 | - | |
| **Amaryllidaceae** | | | | | | | | | | **1.182** |
| *Allium cepa* L. (TB06) | Kitunguu | H | C | Bu | I | Burns | Crushed, and the paste is applied to the affected skin area. | 0.545 | - | |
| *Allium sativum* L. (TB07) | Kitunguu Swaumu | H | C | Bu | I | Burns | Crushed, and the paste is applied to the affected skin area | 0.636 | - | |
| **Anacardiaceae** | | | | | | | | | | 0.773 |
| *Ozoroa engleri* R.Fern. & A.Fern. (TB10) | Mwembepori | T | W | B | N | Sores | Crushed combined with *Euphorbia tirucalli* and the powder applied to the affected area through an enema | 0.182 | LC | |
| *Lannea schweinfurthii* (Engl.) Engl. (TB33) | Mnyumbu | T | W, C | B, L | N | Skin rashes | Crushed and applied to infected skin part | 0.295 | - | |
| *Lannea fulva* (Engl.) Engl. (TB47) | Mselya | S | W | B | N | Wounds | Crushed and used as a bandage for wounds | 0.295 | - | |
| **Annonaceae** | | | | | | | | | | 0.341 |
| *Annona senegalensis* Pers. (TB60) | Mukonola | T | W | R, B | N | Abscesses, cuts, rashes | The decoction is drunk; Bark chewed and smeared on a fresh cut and rashes | 0.341 | LC | |
| **Apocynaceae** | | | | | | | | | | 0.773 |
| *Diplorhynchus condylocarpon* (Müll.Arg.) Pichon (TB24) | Msongati | S | W | B, L | N | Wounds, sores | Pounded and applied to the affected part. For sores, the remedy is enemally applied | 0.386 | LC | |
| *Calotropis procera* (Aiton) W.T.Aiton (TB22) | Mpumbula | S | W, C | R, B | N | Boils | Decoction drunk | 0.386 | LC | |
| **Araceae** | | | | | | | | | | 0.250 |
| *Pistia stratiotes* L. (TB64) | Maleve | H | W | R | N | Burns | Infusion drunk | 0.250 | LC | |
| **Asphodelaceae** | | | | | | | | | | 0.705 |
| *Aloe vera* (L.) Burm.f. (TB18) | Mlovera | H | C | L | | Acne | Decoction drunk | **0.705** | | |
| **Asteraceae** | | | | | | | | | | 0.818 |
| *Bidens pilosa* L. (TB12) | Mndasa | H | W, C | L | N | Wounds, burns, ringworms | Fresh leaves are applied as a paste on the affected part; an infusion of the leaves is used to wash the affected body part | **0.818** | - | |

| Family/Scientific Name (Voucher No.) | Vernacular name | LF | HA | PU | OR | Ailment cured | Preparation and Administration | SUV | CS | FIV |
|---|---|---|---|---|---|---|---|---|---|---|
| **Bignoniaceae** | | | | | | | | | | 0.386 |
| *Kigelia africana* (Lam.) Benth. (TB50) | Mwiegea | T | W | Fr | N | Ringworms | Dry fruit is incinerated, and the ash is applied with oil onto the ringworm infection after an incision | 0.386 | LC | |
| **Burseraceae** | | | | | | | | | | 0.114 |
| *Commiphora africana* (A.Rich.) Engl. (TB51) | Msagasi | S | W | Re | N | Wounds | Resin is used for disinfecting wounds | 0.114 | LC | |
| **Cannabaceae** | | | | | | | | | | 0.568 |
| *Cannabis sativa* L. (TB42) | Bangi | S | W | Fr, L | I | Wounds | Powder of the Leaves and fruits are applied to the wound | 0.568 | - | |
| **Combretaceae** | | | | | | | | | | 0.841 |
| *Combretum adenogonium* Steud. ex A.Rich. (TB19) | Muluzyaminzi | T | W | R, L | N | Wounds | Powdered roots or leaves or a leaf infusion is pasted on fresh wounds | 0.250 | LC | |
| *Combretum pisoniiflorum* (Klotzsch) Engl. (TB59) | Mlama | T | W | L | N | Wounds | Powdered leaves are sprinkled on fresh wounds | 0.295 | LC | |
| *Terminalia sericea* Burch. ex DC. (TB08) | Muzima | T | W | L | N | Burns | Crushed leaves are pasted and applied directly onto burns daily for a week. | 0.091 | LC | |
| *Combretum obovatum* F.Hoffm. (TB16) | Vugoweko | T | W | R | N | Abscesses | Crushed leaves are applied on the affected part through massage | 0.205 | LC | |
| **Cucurbitaceae** | | | | | | | | | | **1.341** |
| *Momordica charantia* L. (TB54) | Umotomoto | H | W, C | Fl, R | N | Wounds | Crushed and the paste applied to the wound | **0.773** | - | |
| *Cucumis dipsaceus* Ehrenb. ex Spach (TB15) | Mgoogo | H | C | R, L | N | Wounds | Leaves and roots are pounded and used as a poultice to treat wounds | 0.568 | - | |
| **Ebenaceae** | | | | | | | | | | 0.227 |
| *Diospyros abyssinica* (Hiern) F.White (TB52) | Mningiwe | T | W | L | N | Wounds, sores | Crushing and infusion swabbed into the affected part and through enema for sores. | 0.227 | LC | |
| **Euphorbiaceae** | | | | | | | | | | **1.250** |
| *Euphorbia hirta* L. (TB20) | Vakikulu | H | W | L | I | Ringworms | Crushed leaves are applied on the affected part through massage | **0.750** | - | |
| *Suregada zanzibariensis* Baill. (TB21) | Mdimu pori | S | W | R, L | N | Rashes | Decoction mixed with roots of *Acalypha frutiosa* Forssk. Drunk; Pounded leaves mixed with a bit of water are pasted on the infected skin part | 0.227 | - | |

| Family/Scientific Name (Voucher No.) | Vernacular name | LF | HA | PU | OR | Ailment cured | Preparation and Administration | SUV | CS | FIV |
|---|---|---|---|---|---|---|---|---|---|---|
| *Acalypha fruticosa* Forssk. (TB26) | Mfulwe | S | | R, L | N | Rashes | Leaves or roots pounded mixed with leaves of *Zanthoxylum chalybeum* and *Suregada zanzibariensis* and applied on affected skin. The decoction of the parts combined with the species mentioned above is drunk | 0.273 | LC | |
| **Fabaceae** | | | | | | | | | | **3.455** |
| *Albizia harveyi* E.Fourn. (TB27) | Mupogolo | T | W | L | N | Abscesses and wounds | Crushed leaves are applied on the affected part through massage | 0.295 | LC | |
| *Isoberlinia angolensis* (Welw. ex Benth.) Hoyle & Brenan (TB29) | Muva | T | W | B | N | Wounds | Decoction drunk | 0.227 | LC | |
| *Pterocarpus angolensis* DC. (TB32) | Mninga | T | W | Sa | N | Wounds | Sap is smeared on the wound | 0.295 | LC | |
| *Tamarindus indica* L. (TB35) | Musisi | T | C | L | I | Wounds | Leaf extract ointment is applied to the wound | 0.386 | LC | |
| *Alantsilodendron pilosum* Villiers (TB58) | Mtunduli | T | W | L | I | Wounds | Powdered leaves are applied to the wound | 0.182 | LC | |
| *Dichrostachys cinerea* (L.) Wight & Arn. (TB36) | Mkulagembe | S | W, C | B, L, Tw | N | Wounds, boils, abscesses | Powdered bark is applied on the affected part, while fresh leaves and twigs are pasted on the affected skin part. | 0.136 | LC | |
| *Pericopsis angolensis* (Baker) Meeuwen (TB56) | Mvunga | T | W | L | N | Sores, burns | Ashes of the burnt leaves are applied to the infected area | 0.114 | LC | |
| *Cassia abbreviata* Oliv. (TB38) | Mlundlunda | T | W | R | N | Sores | Decoction drunk | 0.432 | LC | |
| *Senegalia senegal* (L.) Britton (TB57) | Mgwata | T | W | R | N | Abscesses | Crush the plant part and massage the affected part | 0.159 | - | |
| *Vachellia drepanolobium* (Harms ex Y.Sjöstedt) P.J.H.Hurter (TB53) | Vuvula | S | W, C | R | N | Abscesses | Powdered roots are applied on the affected part through massage | 0.318 | LC | |
| *Vachellia hockii* (De Wild.) Seigler & Ebinger (TB40) | Munyenyela | S | W | R | N | Abscesses | Crushed roots mixed with a small amount of water are applied to the infected area | 0.341 | - | |
| *Dalbergia melanoxylon* Guill. & Perr. (TB49) | Mupingo | T | W | Tw | N | Rashes, abscesses | Crushing and massaging the affected part | 0.227 | **NT** | |
| *Senna singueana* (Delile) Lock (TB44) | Mdimwambuli | T | W | R | N | Wounds | Decoction drunk | 0.295 | LC | |
| **Lamiaceae** | | | | | | | | | | **1.386** |
| *Vitex mombassae* Vatke (TB14) | Mtalali | T | W, C | L | N | Rashes | Powdered leaves are applied on the affected part through massage | 0.250 | LC | |

| Family/Scientific Name (Voucher No.) | Vernacular name | LF | HA | PU | OR | Ailment cured | Preparation and Administration | SUV | CS | FIV |
|---|---|---|---|---|---|---|---|---|---|---|
| *Premna senensis* Klotzsch (TB43) | Mununhwanhala | S | W | L, R | N | Abscesses | Powdering the parts and massage the affected part, mixing with lotion | 0.227 | LC | |
| *Leonotis nepetifolia* (L.) R.Br. (TB31) | Mfyonfyo | H | W, C | AP | N | Wounds, Sores, Cuts | The aerial parts are infused and applied to the affected skin area. | 0.477 | - | |
| *Hoslundia opposita* Vahl (TB41) | Mvulavula | S | W, C | R, L | N | Measles | Pounded leaves soaked in water and applied to the swelling | 0.432 | - | |
| **Loganiaceae** | | | | | | | | | | 0.636 |
| *Strychnos spinosa* Lam. (TB05) | Muchangoko | T | W, C | Fr | N | Warts, wounds | The unripe fruit is cut, and the contents are rubbed over the surface of warts daily or crushed and pasted on wounds. | 0.068 | LC | |
| *Strychnos potatorum* L.f. (TB55) | Mgwegwe | T | W | L | N | Boils | Decoction drunk | 0.386 | - | |
| *Strychnos cocculoides* Baker (TB63) | M'milwa | T | W, C | L | N | Sores | Leaves are pounded and applied on sores | 0.182 | - | |
| **Malvaceae** | | | | | | | | | | 0.977 |
| *Abelmoschus esculentus* (L.) Moench (TB62) | Mbamia | H | C | Se | I | Pimples | Boil in water and drink with tea | 0.705 | - | |
| *Grewia bicolor* Juss. (TB61) | Mkoma | S | W | B | N | Wounds | Chewed and pasted on wounds as a bandage | 0.159 | - | |
| *Grewia similis* K.Schum. (TB09) | Mkomabubu | S | W | B | N | Wounds, sores | The bark is pounded, and the powder is applied on the affected part | 0.114 | - | |
| **Meliaceae** | | | | | | | | | | 0.659 |
| *Azadirachta indica* A. Juss. (TB01) | Mwarobaioni | T | C | L | I | Inflammation | infusion is taken orally and used in fomentation form and for washing the skin | 0.659 | LC | |
| **Moraceae** | | | | | | | | | | 0.091 |
| *Ficus thonningii* Blume (TB34) | Mlumblumba | T | W | B, R | N | Fungal infections | Boil in water and use the mixture for showering | 0.091 | LC | |
| **Moringaceae** | | | | | | | | | | 0.591 |
| *Moringa oleifera* Lam. (TB28) | Mlonge | T | C | L, Se | I | Abscesses, inflammation | The infusion of the leaves is drunk. The seeds are eaten. | 0.591 | LC | |
| **Musaceae** | | | | | | | | | | 0.182 |
| Musa paradisiaca L. (TB37) | Mudizi | H | C | Fr | I | Inflammation, bumps | The fruit is rubbed on the affected area. The infusion is drunk. | 0.182 | LC | |

| Family/Scientific Name (Voucher No.) | Vernacular name | LF | HA | PU | OR | Ailment cured | Preparation and Administration | SUV | CS | FIV |
|---|---|---|---|---|---|---|---|---|---|---|
| **Myrtaceae** | | | | | | | | | | 0.727 |
| *Psidium guajava* L. (TB45) | Mpera | T | C | L | I | Wounds | Ointment of the leaf extracts is applied to the wound area | **0.727** | LC | |
| **Olacaceae** | | | | | | | | | | 0.591 |
| *Ximenia caffra* Sond. (TB46) | Mung'ongo | T | W, C | Tw | N | Sores, wounds, abscesses | Decoction drunk or crush the twigs and massage the affected area to treat the abscess | 0.591 | LC | |
| **Opiliaceae** | | | | | | | | | | 0.091 |
| *Opilia amentacea* Roxb. (TB02) | Mvumbulo | H | W | L | N | Abscesses | Decoction drunk | 0.091 | - | |
| **Phyllanthaceae** | | | | | | | | | | 0.205 |
| *Phyllanthus reticulatus* Poir. (TB13) | Mkasiri | S | W | L | I | Sores, burns | The powdered leaf is applied locally to the affected skin area or enemally applied for sores | 0.205 | LC | |
| **Poaceae** | | | | | | | | | | 0.500 |
| *Zea mays* L. (TB03) | Mhindi | H | C | Co | I | Ringworms | Burn the cob mix with palm oil and rub on the affected part | 0.500 | LC | |
| **Rhamnaceae** | | | | | | | | | | 0.227 |
| *Ziziphus mucronata* Willd. (TB25) | Kagowole | T | W, C | R, L | N | Boils, sores, wounds, | Powdered parts are placed on the affected skin and wrapped with a bandage or enemally applied for sores | 0.227 | LC | |
| **Rutaceae** | | | | | | | | | | 0.773 |
| *Zanthoxylum chalybeum* Engl. (TB23) | Mlungulungu | T | W | B, L, R | N | Abscesses | Crushed parts mixed with palm oil are applied to the affected part through massage | 0.364 | LC | |
| *Citrus aurantifolia* (Christm.) Swingle (TB17) | Mudimu | T | C | Fr | I | wounds | The fruit juice is drunk while the infusion and ointments are applied to the affected part | 0.409 | - | |
| **Sapindaceae** | | | | | | | | | | 0.523 |
| *Zanha africana* (Radlk.) Exell (TB48) | Mkalya | T | W | R | N | Rashes, cut | Decoction drunk or a powder rubbed into incisions | 0.523 | - | |
| **Solanaceae** | | | | | | | | | | 0.773 |
| *Solanum incanum* L. (TB11) | Ntalantu | H | C | R | N | Wounds | Decoction drunk | 0.250 | - | |

| Family/Scientific Name (Voucher No.) | Vernacular name | LF | HA | PU | OR | Ailment cured | Preparation and Administration | SUV | CS | FIV |
|---|---|---|---|---|---|---|---|---|---|---|
| *Nicotiana tabacum* L. (TB39) | Mtumbaku | H | C | L | I | Fungal infections | Ashes of leaves are placed on the affected part | 0.273 | - | |
| *Datura stramonium* L. (TB30) | Mugwata | H | W, C | L | I | Boils | Crushed and pasted on the boils | 0.250 | - | |

**NB:** LF - Life form; T - Tree, H - Herb & S - Shrub,
HA - Habitats; W - Wild, & C - Cultivated
PU - Parts used, L - Leaf, R - Root, B - Bark, Se - Seed, Fr - Fruit, Fl - Flower, Tw - Twigs, AP - Aerial parts, Sa - Sap, Re - Resin, Bu - Bulb & Co - Cob
OR - Origin; N - Native & I - Introduced
CS - Conservation status; LC - Least Concern; NT - Near Threatened
SUV - Species use value; FUV - Family use value
Bold values; The top five highest values

***Informant consensus factor (ICF)***

The agreement level or vice versa among the THs on specific TMPs for managing DDs was scrutinised using the Informant consensus factor (ICF). The ICF results of the reported ailment categories ranged from 0.924 to 0.972. The highest ICF was reported for ringworms and the least for sores (Table 3). The high ICF values reported in this study suggest the highest level of agreement among THs and the use of different TMPs for the management of the DDs in the region (Hussain *et al.* 2019, Teklehaymanot & Giday 2007), which could be due to variability in their knowledge, experience in the healing practice, and the presence of the reported plant taxa in the region. On the other hand, high ICF signifies high utilisation of TMPs for specific ailment categories (Hussain *et al.* 2019). Also, for an indigenous community, the most significant TMP has versatile medicinal uses for treating various ailments and hence is considered an effective medication.

Table 3. Informant consensus factors (ICF) for each ailment category

| Ailment category | Nur | Nt | ICF |
|---|---|---|---|
| Wounds and cuts | 453 | 30 | 0.936 |
| Abscesses | 238 | 13 | 0.949 |
| Fungal infection, boils & inflammation | 140 | 10 | 0.935 |
| Sores | 133 | 11 | 0.924 |
| Burns | 117 | 6 | 0.957 |
| Rashes & measles | 113 | 8 | 0.938 |
| Ringworms | 108 | 4 | 0.972 |
| Warts, acne & pimples | 70 | 3 | 0.971 |

**Comparative study of traditional medicinal plants used for dermatologic ailments**

The comparative analysis of TMPs used to manage DDs in the Tabora region and seven other ethnobotanical studies conducted elsewhere was undertaken. The Jaccard's indices of similarity (JI) ranged from 2.2 to 8.3 (Table 4). The maximum degree of TMPs resemblance (JI = 8.3) was with the study from Northern Maputaland, South Africa, followed by Wakiso District in Uganda, Northern Pakistan and Ebem Ohafia District, Nigeria, with JI values of 6.6, 5.5, and 4.6, respectively. The lowest index was with Central Province, Kenya, with a JI value of 2.2. among the common TMPs, *Allium sativum* L. (Amyryllidaceae) was reported in four countries, Uganda (Tugume *et al.* 2019), Nigeria (Oyedemi *et al.* 2018), Thailand (Saising *et al.* 2022), and Pakistan (Malik *et al.* 2019) to be used for the management of wounds and boils, sores, scabies and wounds, respectively. The comparison of similarities reveals the substantial authenticity of reported data. Likewise, the TMPs not mentioned in other compared works should be prioritised for pharmacological and phytochemical investigations to discover and develop drugs.

Table 4. Comparison of traditional medicinal plants used for dermatological ailments

| Study area | Country | Total documented TMPs | Total TMPs in the present study | Number of common TMPs | Jaccard Index (JI) | Reference |
|---|---|---|---|---|---|---|
| Northern Maputaland | South Africa | 47 | 64 | 10 | 8.3 | (De Wet *et al.* 2013) |
| Songkhla Province | Thailand | 66 | 64 | 6 | 4.4 | (Saising *et al.* 2022) |
| Central Province | Kenya | 27 | 64 | 2 | 2.2 | (Njoroge & Bussmann 2007) |
| Wakiso District | Uganda | 50 | 64 | 8 | 6.6 | (Tugume *et al.* 2019) |
| Northern Pakistan | Pakistan | 56 | 64 | 7 | 5.5 | (Malik *et al.* 2019) |
| Ngaka Modiri Molema District | South Africa | 80 | 64 | 3 | 2.0 | (Asong *et al.* 2019) |
| Ebem-Ohafia District | Nigeria | 61 | 64 | 6 | 4.6 | (Oyedemi *et al.* 2018) |

The common TMPs used against DDs are *Ziziphus mucronata* Willd. (Rhamnaceae), *Ximenia caffra* Sond. (Olacaceae), *Terminalia sericea* Busch ex. DC (Combretaceae), *Strychnos spinosa* Lam. (Lamiaceae), *Solanum incanum L.* (Solanaceae), *Ozoroa engleri* R.Fern. & A.Fern (Anacardiaceae), *Kigelia africana* (Lam.) Benth. (Bignoniaceae), *Dichrostachys cinerea* (L.) Wight & Arn. (Fabaceae), *B. pilosa* L. (Asteraceae) and *Annona senegalensis* Pers. (Annonaceae) with Northen Maputaland, South Africa (De Wet *et al.* 2013); *E. hirta*, *P. guajava*, *A. vera*, *Nicotiana tabacum* L. (Solanaceae), *Azadirachta indica* A. Juss.

(Meliaceae), and *A. sativum* with Songkhla Province in Thailand (Saising *et al.* 2022); *Datura stramonium* L. (Solanaceae) and *Zea mays* L. (Poaceae) in Kenya (Njoroge & Bussmann 2007); *A. vera*, *A. sativum*, *B. pilosa* L. (Asteraceae), *Tamarindus indica* L. (Fabaceae), *Hoslundia opposita* Vahl (Lamiaceae), *Leonotis nepetifolia* (L.) R.Br. (Lamiaceae), *Moringa oleifera* Lam. (Moringaceae) and *N. tabacum* with Wakiso District, Uganda (Tugume *et al.* 2019); *A. sativum*, and *A. cepa*, *Calotropis procera* (Aiton) W.T.Aiton (Apocynaceae), *Cannabis sativa* L. (Cannabaceae), *M. charantia*, *A. esculentus* and *D. stramonium* with northern Pakistan survey (Malik *et al.* 2019); *A. vera*, *A. cepa*, and *Z. mucronata* in Ngaka Modiri Molema District, South Africa (Asong *et al.* 2019); and *P. guajava*, *A. sativum*, and *A. cepa*, *A. senegalensis*, *E. hirta* and *Commiphora africana* (A.Rich) Engl. with a study conducted in Ebem-Ohafia District, Nigeria (Oyedemi *et al.* 2018)

**Literature on pharmacological activities**

Most TMPs recorded in the present study have dermatological cure potential and might possess ingredients or secondary metabolic compounds that are directly or indirectly active against parasites. Some of the most cited TMPs in this study were screened for biological activities from the literature, and some of them were found to be responsible for antimicrobial, antibacterial, antifungal and antiviral activities (Table 5). Therefore, the biological activities exhibited by the various parts of TMPs (Table 5) substantiate the traditional use of these TMPs against DDs. However, further investigations should be conducted to comprehensively examine the isolation of molecules or bioactive compounds responsible for the activities and the detailed mechanism of actions.

Table 5. Literature on preliminary screening of the most cited TMPs

| Botanical name | Use Reports | Plant part | Pharmacological Activity | Reference |
|---|---|---|---|---|
| *Abelmoschus esculentus* (L.) Moench | 31 | Leaf | Antimicrobial | (Elmusa *et al.* 2021) |
| *Allium cepa* L. | 24 | Whole | Antimicrobial | (Santas *et al.* 2010) |
| *Allium sativum* L. | 28 | Whole | Antimicrobial and wound healing | (Sarhan *et al.* 2016) |
| *Aloe vera* (L.) Burm.f. | 31 | Leaf | Antibacterial and wound healing | (Maduna & Patnaik 2023, Subramanian *et al.* 2006) |
| *Annona senegalensis* Pers. | 15 | Root bark | Antibacterial and antifungal | (Okoye *et al.* 2012) |
| *Azadirachta indica* A.Juss. | 29 | Bark | Antibacterial and Wound healing | (Maan *et al.* 2017, Nasrine *et al.* 2023) |
| *Bidens pilosa* L. | 36 | Leaf and flower | Antibacterial and antifungal | (Deba *et al.* 2008) |
| *Calotropis procera* (Aiton) W.T.Aiton | 17 | Leaf | Antibacterial | (Salem, *et al.* 2014) |
| *Cannabis sativa* L. | 25 | Flowers | Antibacterial and antifungal | (Vozza Berardo *et al.* 2024) |
| *Cassia abbreviata* Oliv. | 19 | Stem bark, root bark and leaf | Antibacterial | (Kirabo *et al.* 2018) |
| *Citrus aurantifolia* (Christm.) Swingle | 18 | Leaves | Antibacterial | (Pathan *et al.* 2012) |
| *Cucumis dipsaceus* Ehrenb. ex Spach | 25 | Leaf, stem and fruit | Antimicrobial | (Assefa *et al.* 2023) |
| *Euphorbia hirta* L. | 33 | Leaf, flower stem and root | Antibacterial and antifungal | (Rajeh *et al.* 2010) |
| *Hoslundia opposita* Vahl | 19 | Leaf | Antimicrobial | (Rikohe *et al.* 2023) |
| *Kigelia africana* (Lam.) Benth. | 17 | Stem bark | Antifungal and antibacterial | (Owolabi *et al.*) |
| *Leonotis nepetifolia* (L.) R.Br. | 21 | Leaf and flower | Antimicrobial | (Adolpho *et al.* 2023) |
| *Momordica charantia* L. | 34 | Leaf | Antibacterial and antifungal | (Muribeca *et al.* 2022, Wang *et al.* 2016) |

| Botanical name | Use Reports | Plant part | Pharmacological Activity | Reference |
|---|---|---|---|---|
| *Moringa oleifera* Lam. | 26 | Leaf | Antimicrobial | (Fouad *et al.* 2019) |
| *Psidium guajava* L. | 32 | Leaf | Antimicrobial | (Pereira *et al.* 2023) |
| *Strychnos potatorum* L.f. | 17 | Seed | Antimicrobial | (Sharmila *et al.* 2021) |
| *Tamarindus indica* L. | 17 | Fruit | Antimicrobial and Antivirulence | (Ghaly *et al.* 2023) |
| *Ximenia caffra* Sond. | 26 | Leaf | Antimicrobial | (Munodawafa *et al.* 2013) |
| *Zanha africana* (Radlk.) Exell | 23 | Root bark and root | Antibacterial, Antiviral, and Antifungal | (Kambizi & Afolayan 2001, Runyoro *et al.* 2006) |
| Zea mays L. | 22 | Corn | Antimicrobial | (Abirami *et al.* 2021) |

**Conservation status**

The conservation status of the reported TMPs was substantiated through the International Union for Conservation of Nature (IUCN) Red List of Threatened Species website (IUCN 2022). Out of the documented TMPs, 57.8% (37 species) had the least concern status,1.6% (1 species) was near threatened, and 40.6% (26 species) had no records in the IUCN database (Figure 6). The finding informs us that most of the utilised TMPs in the Tabora region have stable populations. Moreover, more work needs to be done regarding the conservation status of the TMPs that had no information in the database.

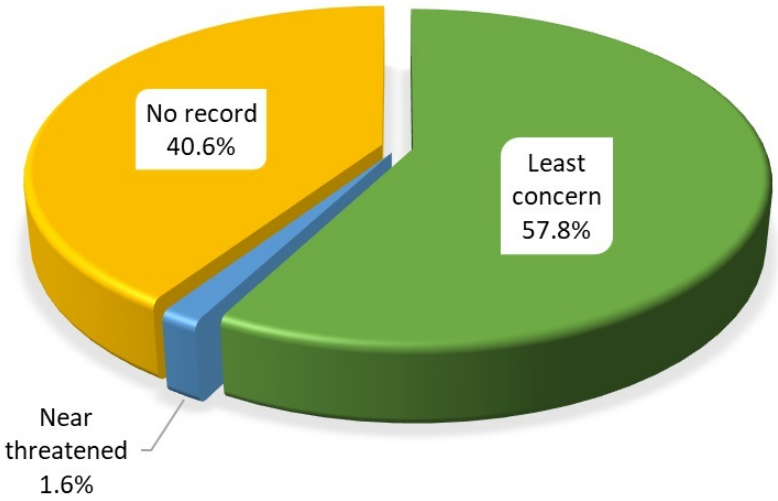


Figure 6. Percentage conservation status of the recorded medicinal plants

## Conclusion

This study is the first of its kind to provide data on traditional knowledge of TMPs used by the Nyamwezi THs for the treatment of DDs in the region. The findings unveiled rich orthodox knowledge possessed by the Nyamwezi THs in dealing with the disorders. The TMPs with high SUV signify the presence of active phytochemical compounds in them and new claims in healing uses exposed that there are many to be learned from the plants. Actually, there is a necessity for the pharmacological, phytochemical, toxicological, microbial, and clinical investigations of the recorded TMPs to come up with general conclusions on ethnopharmacological associations, efficacy and safety of the remedies and for drug discovery and development. Understanding the continuous loss of indigenous knowledge of TMPs, countless efforts are required to undertake floristic and ethnobotanical studies, particularly ethnomedicinal studies in the Tabora region, to conserve TMPs and associated knowledge. This study suggests that *in-situ* and *ex-situ* conservation, together with cultivation practices and resource management, such as good agricultural practices and sustainable use solutions, must be effectively considered for the sustainable utilisation of TMP resources. Moreover, the study recommends the use of biotechnological approaches such as tissue culture, synthetic seed technology, micropropagation, and molecular marker-based strategies to enhance yield and alter the potency of TMPs.

## Declarations

**List of abbreviations:** TMPs - Traditional Medicinal Plants; THs - Traditional Healers; DDs - Dermatological Disorders; FIV - Family Importance Value; SUV - Species Use Value; JI - Jaccard Index; ICF - Informant Consensus Factor.
**Ethical approval and consent to participate**: All traditional healers provided informed consent before the interview.
**Availability of data and materials:** Available upon request from the author.
**Disclosure statement:** The author declares that there are no conflicts of interest.
**Funding:** This work was supported by the Dar es Salaam University College of Education (DUCE) Competitive Research and Innovation Grants of 2020 (Grant number 20030).
**Author's contributions:** DSK conceptualized, designed the study, wrote the manuscript, and approved the final version for publication.

## Acknowledgements

The author thanks the Dar es Salaam University College of Education (DUCE) for funding this research. Moreover, appreciation is extended to the THs who shared their valuable knowledge in this work. Finally, various anonymous reviewers are thanked for their contributions to this article.

## Literature cited

Abirami S, Priyalakshmi M, Soundariya A, Samrot AV, Saigeetha S, Emilin RR, Dhiva S, Inbathamizh L. 2021. Antimicrobial activity, antiproliferative activity, amylase inhibitory activity and phytochemical analysis of corn (*Zea mays* L.) silk ethanol extract. Current Research in Green and Sustainable Chemistry 4:100089.

Adane F, Seyoum G, Alamneh YM, Abie W, Desta M, Sisay B. 2020. Herbal medicine use and predictors among pregnant women attending antenatal care in Ethiopia: a systematic review and meta-analysis. BMC Pregnancy Childbirth 20:157.

Adolpho LO, Paz LHA, Rosa O, Morel AF, Dalcol II. 2023. Chemical profile and antimicrobial activity of *Leonotis nepetifolia* (L.) R. Br. essential oils. Natural Product Research 2023:1-5.

Afzal S, Ahmad HI, Jabbar A, Tolba MM, AbouZid S, Irm N, Zulfiqar F, Iqbal MZ, Ahmad S, Aslam Z. 2021. Use of medicinal plants for respiratory diseases in Bahawalpur, Pakistan. S Ahmed (ed.). BioMed Research International 2021:1-10.

Alkhamaiseh SI, Aljofan M. 2020. Prevalence of use and reported side effects of herbal medicine among adults in Saudi Arabia. Complementary Therapies in Medicine 48:102255.

Al-Robai SA, Ahmed AAE, Mohamed HA, Ahmed AA, Zabin SA, Alghamdi AAA. 2022. Qualitative and quantitative ethnobotanical survey in Al Baha Province, Southwestern Saudi Arabia. Diversity 14:867.

Asong JA, Ndhlovu PT, Khosana NS, Aremu AO, Otang-Mbeng W. 2019. Medicinal plants used for skin-related diseases among the Batswanas in Ngaka Modiri Molema District Municipality, South Africa. South African Journal of Botany 126:11-20.

Assefa T, Tesso H, Abdisa E, Guta L, Melaku Y. 2023. Chemical composition and antibacterial activity of essential oils from selected species of the genus Cucumis in Ethiopia. Bulletin of the Chemical Society of Ethiopia 37:703-715.

Boadu AA, Asase A. 2017. Documentation of herbal medicines used for the treatment and management of human diseases by some communities in Southern Ghana. Evidence-Based Complementary and Alternative Medicine 2017:3043061.

Chaachouay N, Benkhnigue O, Fadli M, El Ibaoui H, Zidane L. 2019. Ethnobotanical and ethnopharmacological studies of medicinal and aromatic plants used in the treatment of metabolic diseases in the Moroccan Rif. Heliyon 5:e02191.

Chinsembu KC. 2016. Ethnobotanical study of medicinal flora utilised by traditional healers in the management of sexually transmitted infections in Sesheke District, Western Province, Zambia. Brazilian Journal of Pharmacognosy 26:268-274.

Cordero CS, Meve U, Alejandro GJD. 2022. Ethnobotanical documentation of medicinal plants used by the indigenous Panay Bukidnon in Lambunao, Iloilo, Philippines. Frontier Pharmacology 12:790567.

De Wet H, Nciki S, Van Vuuren SF. 2013. Medicinal plants used for the treatment of various skin disorders by a rural community in northern Maputaland, South Africa. Journal of Ethnobiology and Ethnomedicine 9:51.

Deba F, Xuan TD, Yasuda M, Tawata S. 2008. Chemical composition and antioxidant, antibacterial and antifungal activities of the essential oils from *Bidens pilosa* Linn. var. Radiata. Food Control 19:346-352.

Ekor M. 2014. The growing use of herbal medicines: issues relating to adverse reactions and challenges in monitoring safety. Frontier Pharmacology 4:177.

Elmusa F, Aygun A, Gulbagca F, Seyrankaya A, Göl F, Yenikaya C, Sen F. 2021. Investigation of the antibacterial properties of silver nanoparticles synthesized using *Abelmoschus esculentus* extract and their ceramic applications. International Journal of Environmental Science and Technology 18:849-860.

Enebeli-Ekwutoziam K, Aruah CB, Ogbonna BO, Eze UJ, Egedeye-Fubura FS, Nwankwo CF, Oliseyenum IN, Udoha NW, Afuye TN, Asogwa GN, *et al.* 2021. Ethnobotany, ethnomedicine, herbal drugs, Northern Delta State, Nigeria. Asian Journal of Ethnobiology 4:76-85.

Fouad EA, Abu Elnaga ASM, Kandil MM. 2019. Antibacterial efficacy of *Moringa oleifera* leaf extract against pyogenic bacteria isolated from a dromedary camel (*Camelus dromedarius*) abscess. Veterinary World 12:802-808.

Gessler MC, Msuya DE, Nkunya MHH, Mwasumbi LB, Schär A, Heinrich M, Tanner M. 1995. Traditional healers in Tanzania: the treatment of malaria with plant remedies. Journal of Ethnopharmacology 48:131-144.

Ghaly MF, Albalawi MA, Bendary MM, Shahin A, Shaheen MA, Abu Eleneen AF, Ghoneim MM, Elmaaty AA, Elrefai MFM, Zaitone SA, *et al.* 2023. *Tamarindus indica* extract as a promising antimicrobial and antivirulence therapy. Antibiotics 12:464.

Giesey RL, Mehrmal S, Uppal P, Delost G. 2021. Global burden of skin and subcutaneous disease: a longitudinal analysis from the global burden of disease study from 1990-2017. SKIN The Journal of Cutaneous Medicine 5:125-136.

Grice EA, Kong HH, Conlan S, Deming CB, Davis J, Young AC, NISC Comparative Sequencing Program, Bouffard GG, Blakesley RW, Murray PR, *et al.* 2009. Topographical and temporal diversity of the human skin microbiome. Science 324:1190-1192.

Halder S, Banerjee S, Halder A, Pal PR. 2012. Skin diseases in HIV-infected patients: Impact of immune status and histological correlation. Indian Journal of Sexually Transmitted Diseases and AIDS 33:65-67.

Heinrich M, Lardos A, Leonti M, Weckerle C, Willcox M, Applequist W, Ladio A, Lin Long C, Mukherjee P, Stafford G. 2018. Best practice in research: consensus statement on ethnopharmacological field studies - ConSEFS. Journal of Ethnopharmacology 211:329-339.

Hussain S, Hamid A, Ahmad KS, Mehmood A, Nawaz F, Ahmed H. 2019. Quantitative ethnopharmacological profiling of medicinal shrubs used by indigenous communities of Rawalakot, District Poonch, Azad Jammu and Kashmir, Pakistan. Brazilian Journal of Pharmacognosy 29:665-676.

Iragi GK, Rusaati BIW, Nfizi IB, Masumbuko CN, Gendusa PA, Furaha AM, Kang J-W. 2021. Ethnomedicinal study of plants used in the Uvira Territory (Democratic Republic of Congo). Forest Science and Technology 17:144-154.

IUCN. 2022. The IUCN red list of threatened species. IUCN Red List of Threatened Species. Website (https://www.iucnredlist.org/).

Kacholi DS, Amir HM. 2022a. Ethnobotanical survey of medicinal plants used by traditional healers in managing gonorrhoea and syphilis in Urambo district, Tabora region, Tanzania. Journal of Herbs, Spices and Medicinal Plants 28:179-192.

Kacholi DS, Amir HM. 2022b. Herbal remedies used by traditional healers to treat haemorrhoids in Tabora region, Tanzania. Pharmaceutical Biology 60:2182-2188.

Kacholi DS, Amir HM. 2022c. Ethnomedicinal survey of antidiarrheal plants of the Nyamwezi people of Nsenda ward in Urambo District, central western Tanzania. Ethnobotanical Research and Applications 24:1-14.

Kacholi DS, Amir HM. 2023. Ethnobotanical study of medicinal plants traditionally used against erectile dysfunction in Tabora region, Tanzania. Ethnobotanical Research and Applications 25:1-12.

Kacholi DS, Kalokora OJ, Amir HM, Mogha NG. 2023. Ethnogynaecological medicinal plants used by Tanzanian communities against female infertility and menstrual disorders: a comprehensive review. Ethnobotanical Research and Applications 26:25.

Kamanja IT, Mbaria JM, Gathumbi PK, Mbaabu M, Lanyasunya A, Gakuya DW, Kabasa JD, Kiama SG. 2015. Medicinal plants used in the management of sexually transmitted infections by the samburu community, Kenya. International Journal of Pharmaceutical Research 7:44-52.

Kambizi L, Afolayan AJ. 2001. An ethnobotanical study of plants used for the treatment of sexually transmitted diseases (njovhera) in Guruve District, Zimbabwe. Journal of Ethnopharmacology 77:5-9.

Karimkhani C, Dellavalle RP, Coffeng LE, Flohr C, Hay RJ, Langan SM, Nsoesie EO, Ferrari AJ, Erskine HE, Silverberg JI, *et al.* 2017. Global skin disease morbidity and mortality: an update from the global burden of disease study 2013. JAMA Dermatology 153:406.

Kirabo I, Mabiki FP, Mdegela RH, Obbo CJD. 2018. *In Vitro* Antibacterial potential of extracts of *Sterculia africana*, *Acacia sieberiana*, and *Cassia abbreviata* ssp. *abbreviata* used by yellow baboons *(Papio cynocephalus)* for possible self-medication in Mikumi National Park, Tanzania. International Journal of Zoology 2018:1-6.

Maan P, Yadav KS, Yadav NP. 2017. Wound healing activity of *Azadirachta indica* A. Juss stem bark in Mice. Pharmacognosy Magazine 13:S316-S320.

Maduna L, Patnaik A. 2023. A review of wound dressings treated with *Aloe vera* and its application on natural fabrics. Journal of Natural Fibers 20:2190190.

Maema LP, Potgieter MJ, Samie A. 2019. Ethnobotanical survey of invasive alien plant species used in the treatment of sexually transmitted infections in Waterberg District, South Africa. South African Journal of Botany 122:391-400.

Mahwasane ST, Middleton L, Boaduo N. 2013. An ethnobotanical survey of indigenous knowledge on medicinal plants used by the traditional healers of the Lwamondo area, Limpopo province, South Africa. South African Journal of Botany 88:69-75.

Malik A, Akbar E, Afza N, Hai S. 2022. Flavone glycosides and bergenin derivatives from *Tridax procumbens*. Heterocycles 57:733-739.

Malik K, Ahmad M, Zafar M, Ullah R, Mahmood HM, Parveen B, Rashid N, Sultana S, Shah SN, Lubna. 2019. An ethnobotanical study of medicinal plants used to treat skin diseases in northern Pakistan. BMC Complementary and Alternative Medicine 19:210.

Maroyi A. 2013. Traditional use of medicinal plants in south-central Zimbabwe: review and perspectives. Journal of Ethnobiology and Ethnomedicine 9:31.

Mathibela MK, Potgieter MJ, Tshikalange TE. 2019. Medicinal plants used to manage sexually transmitted infections by Bapedi traditional health practitioners in the Blouberg area, South Africa. South African Journal of Botany 122:385-390.

Mengist Dessie A, Fenta Feleke S, Getaye Workie S, Getinet Abebe T, Mossu Chanie Y, Kassa Yalew A. 2022. Prevalence of skin disease and its associated factors among primary schoolchildren: a cross-sectional study from a northern Ethiopian Town. Clinical, Cosmetic and Investigational Dermatology 15:791-801.

Miguéis GDS, Da Silva RH, Damasceno Júnior GA, Guarim-Neto G. 2019. Plants used by the rural community of Bananal, Mato Grosso, Brazil: Aspects of popular knowledge. DA Lightfoot (ed.). PLOS ONE 14:e0210488.

Mujinja PG, Saronga HP. 2022. Traditional and Complementary Medicine in Tanzania: Regulation awareness, adherence and challenges. International Journal of Health Policy and Management 11:1496-1504.

Munodawafa T, Chagonda LS, Moyo SR. 2013. Antimicrobial and phytochemical screening of some Zimbabwean medicinal plants. Journal of Biologically Active Products from Nature 3:323-330.

Muribeca A de JB, Gomes PWP, Paes SS, da Costa APA, Gomes PWP, Viana J de S, Reis JDE, Pamplona S das GSR, Silva C, Bauermeister A, *et al.* 2022. Antibacterial activity from *Momordica charantia* L. Leaves and flavones enriched phase. Pharmaceutics 14:1796.

Nasrine A, Narayana S, Gulzar Ahmed M, Sultana R, Noushida N, Raunak Salian T, Almuqbil M, Almadani ME, Alshehri A, Alghamdi A, *et al.* 2023. Neem (*Azadirachta Indica*) and silk fibroin-associated hydrogel: boon for wound healing treatment regimen. Saudi Pharmaceutical Journal 31:101749.

Neamsuvan O, Komonhiran P, Boonming K. 2018. Medicinal plants used for hypertension treatment by folk healers in Songkhla province, Thailand. Journal of Ethnopharmacology 214:58-70.

Njoroge GN, Bussmann RW. 2007. Ethnotherapeautic management of skin diseases among the Kikuyus of Central Kenya. Journal of Ethnopharmacology 111:303-307.

Okoye TC, Akah PA, Okoli CO, Ezike AC, Omeje EO, Odoh UE. 2012. Antimicrobial Effects of a Lipophilic Fraction and Kaurenoic Acid Isolated from the Root Bark Extracts of *Annona senegalensis*. Evidence-Based Complementary and Alternative Medicine 2012:1-10.

Olanipekun MK. 2023. Ethnobotanical relevance and conservation of medicinal plants used to treat human diseases in Ifedore, Ondo-State, Nigeria. Asian Journal of Ethnobiology 6:7-19.

Owolabi OJ, Omogbai EKI, Obasuyi O. 2007. Antifungal and antibacterial activities of the ethanolic and aqueous extract of *Kigelia africana* (Bignoniaceae) stem bark. African Journal of Biotechnology 6:1677-1680.

Oyedemi BO, Oyedemi SO, Chibuzor JV, Ijeh II, Coopoosamy RM, Aiyegoro AO. 2018. Pharmacological evaluation of selected medicinal plants used in the management of oral and skin infections in Ebem-Ohafia District, Abia State, Nigeria. The Scientific World Journal 2018:1-16.

Palchetti MV, Zamudio F, Zeballos S, Davies A, Barboza GE, Giorgis MA. 2023. Large-scale patterns of useful native plants based on a systematic review of ethnobotanical studies in Argentina. Perspectives in Ecology and Conservation 21:93-100.

Pathan RK, Gali PR, Pathan P, Gowtham T, Pasupuleti S. 2012. In vitro Antimicrobial activity of *Citrus aurantifolia* and its phytochemical screening. Asian Pacific Journal of Tropical Disease 2:S328-S331.

Pereira GA, Chaves DS de A, Silva TME, Motta RE de A, Silva ABR da, Patricio TC da C, Fernandes AJB, Coelho S de M de O, Ożarowski M, Cid YP, *et al.* 2023. Antimicrobial activity of *Psidium guajava* aqueous extract against sensitive and resistant bacterial strains. Microorganisms 11:1784.

Rajeh MAB, Zuraini Z, Sasidharan S, Latha LY, Amutha S. 2010. Assessment of *Euphorbia hirta* L. leaf, flower, stem and root extracts for their antibacterial and antifungal activity and Brine shrimp lethality. Molecules 15:6008-6018.

Rikohe IF, Mlozi SH, Ngondya IB. 2023. Seasons and bee foraging plant species strongly influence honey antimicrobial activity. Journal of Agriculture and Food Research 12:100622.

Runyoro DKB, Ngassapa OD, Matee MIN, Joseph CC, Moshi MJ. 2006. Medicinal plants used by Tanzanian traditional healers in the management of Candida infections. Journal of Ethnopharmacology 106:158-165.

Saising J, Maneenoon K, Sakulkeo O, Limsuwan S, Götz F, Voravuthikunchai SP. 2022. Ethnomedicinal plants in herbal remedies used for treatment of skin diseases by traditional healers in Songkhla Province, Thailand. Plants 11:880.

Salem, WM, Sayed, WF, Haridy, M, Hassan, NH. 2014. Antibacterial activity of *Calotropis procera* and *Ficus sycomorus* extracts on some pathogenic microorganisms. African Journal of Biotechnology 13:3271-3280.

Santas J, Almajano MP, Carbó R. 2010. Antimicrobial and antioxidant activity of crude onion (*Allium cepa* L.) extracts. International Journal of Food Science & Technology 45:403-409.

Sarhan WA, Azzazy HME, El-Sherbiny IM. 2016. Honey/Chitosan Nanofiber Wound Dressing Enriched with *Allium sativum* and *Cleome droserifolia*: Enhanced Antimicrobial and Wound Healing Activity. ACS Applied Materials and Interfaces 8:6379-6390.

Satimia FT, McBride SR, Leppard B. 1998. Prevalence of skin disease in rural Tanzania and factors influencing the choice of health care, modern or traditional. Archives of Dermatology 134 (11): 1363-1366.

Sharmila C, Selvam R, Subramanian SP. 2021. Evaluation of bactericidal and fungicidal efficacy of *Strychnos potatorum* Linn. (Nirmali) seeds. Asian Journal of Research in Biochemistry 8 (1):1-10.

Sikuku LM, Njoroge MB, Suba VO, Oluoch EA, Mbogo JR, Li Y. 2023. Ethnobotany and quantitative analysis of medicinal plants used by the people of Malava sub-county, Western Kenya. Ethnobotanical Research and Applications 26:1-20.

Subramanian S, Kumar DS, Arulselvan P. 2006. Wound healing potential of *Aloe vera* leaf gel studied in experimental rabbits. Asian Journal of Biochemistry 1:178-185.

Sundararajan R, Alakiu R, Ponticiello M, Birch G, Kisigo G, Okello E, Peck RN. 2023. Understanding traditional healer utilisation for hypertension care using the Andersen model: A qualitative study in Mwanza, Tanzania. Global Public Health 18:2191687.

Tahir M, Gebremichael L, Beyene T, Van Damme P. 2021. Ethnobotanical study of medicinal plants in Adwa District, Central Zone of Tigray Regional State, Northern Ethiopia. Journal of Ethnobiology and Ethnomedicine 17:71.

Teklehaymanot T, Giday M. 2007. Ethnobotanical study of medicinal plants used by people in Zegie Peninsula, Northwestern Ethiopia. Journal of Ethnobiology and Ethnomedicine 3:12.

Tugume P, Nambejja C, Nyakoojo C, Kamatenesi-Mugisha M. 2019. Medicinal plant species used in the treatment of skin diseases in Katabi subcounty, Wakiso District, Uganda. Ethnobotanical Research and Applications 18:1-17.

Urban K, Chu S, Giesey RL, Mehrmal S, Uppal P, Delost ME, Delost GR. 2021. Burden of skin disease and associated socioeconomic status in Asia: a cross-sectional analysis from the global burden of disease study 1990-2017. JAAD International 2:40-50.

Uwimbabazi M, Kabinesa B, Ongarep SV, Omujal F, Agaba H. 2023. Ethnobotanical survey of medicinal plants used for the treatment of diabetes in Uganda. Ethnobotanical Research and Applications 26:1-14.

Vozza Berardo ME, Mendieta JR, Villamonte MD, Colman SL, Nercessian D. 2024. Antifungal and antibacterial activities of *Cannabis sativa* L. resins. Journal of Ethnopharmacology 318:116839.

Wang S, Zheng Y, Xiang F, Li S, Yang G. 2016. Antifungal activity of *Momordica charantia* seed extracts toward the pathogenic fungus *Fusarium solani* L. J Food Drug Anal 24:881-887.

Wanga L, Nyamboki DK. 2023. Medicinal plants used in the management of skin disorders in Kenya: a review. Pharmacognosy Reviews 17:69-103.

Wiryono W, Sriwahyuni, Winanda GA, Saprinurdin, Nurliana S. 2019. The diversity of useful plants and botanical knowledge of the Rejang Tribe in Kepahiang District, Bengkulu Province, Indonesia. Journal of Biological Diversity 20:3599-3607.

Zenderland J, Hart R, Bussmann RW, Paniagua Zambrana NY, Sikharulidze S, Kikvidze Z, Kikodze D, Tchelidze D, Khutsishvili M, Batsatsashvili K. 2019. The use of “Use Value”: quantifying importance in ethnobotany. Economic Botany 73:293-303.