

Ethnomedicinal survey of coastal plants for economic development in the Eastern Cape province

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Background: South Africa is a biodiversity hotspot, particularly within the Cape Floristic Region, Succulent Karoo and Maputoland–Pondoland–Albany. These regions harbour high levels of endemism and support indigenous communities who depend on local flora for medicine and culture. Documenting these plants and their uses is critical for conserving biodiversity and indigenous knowledge.

Aim: To investigate traditional medicinal uses of indigenous coastal plants in the Eastern Cape Province.

Setting: The study was conducted at the University of Fort Hare, with interviews held in Mdantsane, Motherwell and Zidindi village, targeting traditional healers and street vendors.

Methods: Data were collected using structured questionnaires from 35 purposively selected respondents. Analyses were performed using SPSS, use-value, and fidelity level indices.

Results: Twenty-four indigenous coastal plant species from 21 families were recorded, with *Asteraceae* most frequently cited. Leaves (87.5%) were the most utilised plant part, while decoctions (66.7%) were the preferred preparation method. Oral administration dominated (87.5%). Shrubs (41.6%) and trees (37.5%) were the main growth forms. *Helichrysum cymosum* exhibited a 100% fidelity level for its use as an analgesic.

Conclusion: While most plants remain actively used, some are underutilised due to scarcity and habitat loss.

Contribution: Policymakers should promote sustainable harvesting and cultivation for herbal medicine markets. Further scientific validation of bioactive compounds and safety is necessary to support pharmaceutical development and broader applications.

Keywords: coastal flora; herbal medicine; indigenous knowledge; pharmaceuticals; pharmacological validation.

Introduction

Ethnomedicine is the study of traditional medicine incorporating bioactive compounds derived from plants and animals across various cultural communities (Adeleye et al. 2021). For centuries, generations of indigenous inhabitants in developing nations, including South Africa, have relied on medicinal plants and traditional medicines for the treatment of various human and animal-related diseases and disorders (Hulley and Van Wyk, 2019). Because of widespread utilisation of these species in developing countries, multinational companies have isolated active compounds and established a profitable industry, thereby converting traditional healthcare into a commercial enterprise (Van Wyk 2015).

However, several publications have reported that a wide range of underutilised and neglected plant species can still be found in South Africa (Mudau et al. 2021), particularly along the Cape coast. Historical evidence indicates that early inhabitants directly relied on coastal vegetation habitats for food, shelter, medical needs, energy and other ecosystem services to support their livelihood (Rêgo, Soares-Gomes & Da Silva 2018). However, their utilisation became unstable and declined over time because of the absence of organised cultivation practices (Yeshiwas, Tadele & Tiruneh 2019) and the erosion of traditional knowledge.

These plants can be used to address economic development in poorly developed provinces such as the Eastern Cape, which continues to face the triple burden of malnutrition (Modjadji & Madiba 2019), defined as the simultaneous co-existence of diet-related diseases, undernutrition – including underweight, thinness and stunted growth – and overnutrition, including obesity

and overweight (Govender et al. 2021). The province is further constrained by low education quality, insufficient infrastructure, poor service delivery, high crime rates, water scarcity, high population growth and high unemployment (Moyo, Mishi & Ncwadi 2022).

Moreover, it has one of the weakest healthcare systems in the country, despite South Africa allocating significantly more resources to healthcare than many other middle-income countries that achieve better outcomes (Willie & Maqbool 2023). Recent studies highlight that because of the high costs of quality healthcare and private facilities, many low-income families are unable to afford these services (Willie & Maqbool 2023), and consequently succumb to treatable illnesses.

At the same time, the third Sustainable Development Goal (SDG 3) seeks to promote well-being and ensure healthy lives for people of all ages, underscoring the urgent need for alternative, affordable and accessible healthcare solutions. Therefore, this study aims to document indigenous coastal medicinal plants in selected localities of the Eastern Cape province and to explore their sustainable cultivation for integration into the herbal medicine trade. Such an approach has the potential to improve community health through affordable, locally accessible remedies, while simultaneously ensuring the preservation of valuable plant species and the intergenerational transfer of ethnomedicinal knowledge (Fajinmi, Olarewaju & Van Staden 2023).

Research methods and design

Study area

The main study was conducted at the University of Fort Hare, Alice Campus ($-32^{\circ}46'59.99''$ S $26^{\circ}52'59.99''$ E), situated at an elevation of 524 m above sea level within the Raymond Mhlaba Municipality, Amathole District, Eastern Cape, South Africa. Questionnaires were administered across three study sites: Zidindi village ($31^{\circ}58'60''$ S; $29^{\circ}1'0''$ E) in the King Sabatha Dalindyebo Municipality, and the townships of Motherwell ($33^{\circ}48'14''$ S $25^{\circ}34'48''$ E) in the Nelson Mandela Bay Metropolitan Municipality (NMBMM) and Mdantsane ($32^{\circ}57'0''$ S; $27^{\circ}46'0''$ E) in the Buffalo City Metropolitan Municipalities (BCMM) (study sites 1–3; Figure 1). According to informal census estimates, study site 1 (Zidindi) is a small rural settlement near the Wild Coast Coffee Bay, with a population of less than 100 residents. The area experiences a wet climate with an annual average rainfall of 1059 mm. Study site 2 (Motherwell) receives an annual average rainfall of 529 mm, while study site 3 (Mdantsane) has an average annual rainfall of around 850 mm.

Voucher specimen identification

Ethnobotanists have traditionally relied on the collection of voucher specimens and their deposition in herbaria for accurate plant identification (Greene, Teixidor-Toneu & Odone 2023). According to Dold and Cocks (2002), the use of vernacular names to identify medicinal plant species in informal markets is unreliable, as these names often vary

across regions and even among traders within the same market. To address this challenge, volunteer respondents assisted in identifying plants by their vernacular names at each study site, after which voucher specimens were collected and deposited in the Department of Botany Herbarium, University of Fort Hare (Alice Campus), for authentication.

Confidentiality agreement

Both traditional healers and street vendors were informed that the surveys were undertaken exclusively for research purposes, and that the information provided would contribute to the protection and preservation of traditional knowledge of indigenous plants, the enhancement of rural health and livelihoods, and the potential discovery and development of novel herbal medicines aimed at addressing the socio-economic challenges of their communities and South Africa more broadly. Before participation, all respondents were required to sign the University of Fort Hare informed consent form.

Ethnomedicinal investigation

This study focused on evaluating and assessing the underutilised coastal indigenous plants with therapeutic effects in the Eastern Cape. A well-structured set of questionnaires with open- and closed-ended questions were allocated to 35 respondents, including nine street vendors in Motherwell, five traditional healers and five street vendors in Mdantsane, as well as four traditional healers and 12 street vendors in Zidindi, before the study. The sample size ($N = 35$) may appear relatively low compared to the wider population of the study sites; however, the study specifically focused on indigenous coastal flora and therefore purposively targeted respondents who specialise in these species or possess significant knowledge. Similar ethnobotanical surveys have used comparable sample sizes, for example, Raseth, Semenya and Maroyi (2019) identified medicinal plants traded in informal herbal markets across five districts in the Limpopo Province using 35 respondents. Empirical syntheses show that theme saturation is often achieved with approximately 9–17 interviews in homogenous participant groups, while meaning saturation may require about 24 interviews, and theoretical saturation can be reached



Source: Esri, 2021, ArcGIS desktop: Release 10.8.2, Environmental Systems Research Institute, Redlands, CA.

FIGURE 1: Study areas and their nearest coastal habitats.

within 20–30 or more interviews, depending on study complexity (Green and Thorogood 2018; Wutich, Beresford & Bernard 2024). Furthermore, the concept of information power emphasises that sample adequacy is determined by the specificity and richness of data, thereby supporting the sufficiency of 35 expert respondents in generating robust and reliable findings (Malterud, Siersma & Guassora 2016).

The discussions were held in isiXhosa, isiZulu and English, respectively, because 30 out of the 35 street vendors were of Xhosa descent and the remaining five were of Zulu descent. The main questions included: (1) the number of years of experience in growing and/or selling these plants; (2) their medicinal uses; (3) their preparation and administration methods and (4) their effectiveness. The effectiveness in this study refers to the perceived success or reliability as reported by the respondents, rather than clinically tested efficacy. Followed by validation through respondent consensus, wherein two or more participants provided similar or identical responses, regardless of the method of administration (Afolayan et al. 2014).

Ethical considerations

Ethical clearance to conduct this study was obtained from the University of Fort Hare Inter-Faculty Human Research Ethics Committee. The ethical clearance number is WIT031SSOG01.

Results and discussion

Respondents' demographic profiles

The demographics of the respondents are recorded using Table 1. The ages of the respondents were between 30–63-years-old, and 25.7% ($n = 9$) of them were 30–39-years-old, 20% ($n = 7$) were between 40–49-years-old, 37.1% ($n = 13$) were 50–59, and finally 17.1% ($n = 6$) were 60–63-years-old. More than half the respondents, 51.4% ($n = 18$), were female and 48.6% ($n = 17$) were male. About 25.7% of them were traditional healers from Mdantsane and Zidindi, and 74.3% were street vendors from all three study areas. Their educational background ranged from none to secondary school, where 8.5% ($n = 3$) of them were illiterate, 40% ($n = 14$) attended primary school, and more than half of the respondents, 51.4% ($n = 18$), had a high school education. Their experiences working with indigenous plants ranged from 5–35 years, and more than half of them, 25.7% and 28.6% had been working with these plants for more than 20 years, while the newcomers, 14.3% ($n = 5$), had been in the business for 5–10 years.

The ages and the experiences of the respondents were observed to be correlated to each other; those within the age bracket of 50–63-years-old were found to have more experience and insights than the younger generation, regardless of their educational background. They revealed that they obtained most of their indigenous knowledge through word of mouth from their parents and forefathers. The majority of the youngest group (30–39-years-old) acquired their ethnomedicinal

TABLE 1: Demographic characteristics of all the respondents.

Variable	Description	%
Age (years)	30–39	25.7
	40–49	20.0
	50–59	37.1
	≥ 60	17.1
Gender	Female	51.4
	Male	48.6
Education status	None	8.5
	Primary	40.0
	Secondary or High school	51.4
	Tertiary	-
Profession	Street vendor	74.3
	Traditional healer	25.7
Experience (years)	5–10	14.3
	11–16	17.1
	17–19	14.3
	20–25	25.7
	26–31	-
	32–37	28.6

knowledge through spiritual callings, as they are traditional healers, while the remaining few street vendors gained theirs through informal apprenticeship, primarily by observation and practice.

These findings correspond with a survey conducted by Falemara et al. (2021) whereby it was found that the older generation had more traditional knowledge of the indigenous plants surveyed than the youth. This observation may vary across different areas because of variability in socio-economic development. For instance, a survey conducted by Olanipekun et al. (2016) showed that the younger people contributed a significant traditional knowledge of indigenous plants compared to elders.

Furthermore, the demographic profile of the study shows that more than half of the respondents (51.4%) were female, which suggests that women are more hands-on when it comes to the knowledge and production of medicinal plants than men in the study sites. In accordance with the study conducted by Sumardjo (2021), it was reported that the majority of the respondents were women and they possessed and shared a deeper understanding of indigenous medicinal plants.

Data analysis

Data were analysed using Statistical Package for the Social Sciences (SPSS), as well as use-value and fidelity level metrics. Use-value was calculated using Equation 1, as simplified by Albuquerque et al. (2006):

$$UV = \frac{\sum U_i}{N} \quad [\text{Eqn 1}]$$

where $\sum U_i$ is the sum of all the plant uses cited by the respondents

N is the total number of all the respondents interviewed

Fidelity level

Fidelity level was used to measure the importance and popularity of the plant for a particular disease and ailment from the respondent, and it was calculated using Equation 2 as described by Friedman et al. (1986):

$$FL = \frac{Np}{N} \times 100 \quad [\text{Eqn 2}]$$

where Np denotes the number of respondents who cited the plant for a specific disease/ailment.

N denotes the total number of respondents who cited the plant for any disease/ailment.

Plant selection

A total of 21 unique families encompassing 24 species of coastal indigenous plants were selected and recorded for this study using a purposive selection, focusing on underutilised, coastal indigenous medicinal plants used by selected local communities in the Eastern Cape. The scientific names and authorities were verified using the World Flora Online (WFO; <https://www.worldfloraonline.org>) and the African Plant Database (AFD; <https://africanplantdatabase.ch>).

The most represented family was Asteraceae, comprising four plants (*Tarchonanthus camphoratus*, *Helichrysum cymosum*, *Gazania rigens* and *Eriocephalus africanus*) (Table 2)

and all of them are used as an analgesic to relieve pain in wounds, cuts, headache, earache, etc., except for *E. africanus*, which is used as an anti-inflammatory for arthritis. Aizoaceae was the second most represented family with three plants (*Carpobrotus edulis*, *Tetragonia decumbens* and *Aptenia cordifolia*). Each species recorded was found to cure more than one ailment; for instance, *A. cordifolia* was found to treat nine diseases and ailments with a 77.8% fidelity level. The majority of these plants have multiple pharmacological effects against major human diseases such as cancer, tuberculosis and diabetes, which are some of the leading causes of death.

According to Table 3, the use-values and fidelity levels of these plants are significantly high, suggesting a higher accuracy and effectiveness, implying that they can be safely used as herbs and pharmaceuticals to treat various diseases and ailments cited in this study. Furthermore, the World Health Organization (WHO) states that 'herbal remedies fulfil the health requirements of around 80% of global populations, particularly for millions residing in the extensive rural regions of developing nations' (Hosseinizadeh et al. 2015).

Plant parts used for the preparation of herbal medicine

Descriptive analysis of the commonly used plant parts in the preparation of herbal medicine was performed using SPSS,

TABLE 2: Growth forms, parts used, preparation and administration methods of all the plants documented in this study.

Number	Plant name	Morphological nature	Parts used	Preparation method	Administration method	No. of cites
1	<i>Aptenia cordifolia</i>	Creeping herb (≤ 0.1 m)**	Leaves, stem, flowers and roots	Decoction and infusion	Oral	9
2	<i>Bulbine frutescens</i>	Shrub (3 – 6 m)***	Leaves, rhizome and roots	Poultice, infusions	Oral and topical	12
3	<i>Burchellia bubalina</i>	Small tree (≤ 8 m)*	Leaves and roots	Burning and decoction	Topical and inhalation	7
4	<i>Carissa edulis</i>	Small tree (≤ 6 m)*	Bark, roots, leaves and fruit	Decoction and infusions	Oral	9
5	<i>Carissa macrocarpa</i>	Shrub (≤ 4 m)*	Leaves, fruit and roots	Decoction	Oral	9
6	<i>Carpobrotus edulis</i>	Creeping groundcover (≤ 3 m)**	Stem and leaves	Decoction and burning	Oral, inhalation and topical	14
7	<i>Dasispermum suffruticosum</i>	Sub-shrub (≤ 0.4 m)*	Whole plant	Boiling and infusion	Oral	7
8	<i>Eriocephalus africanus</i>	Shrub (≤ 1 m)***	Stem, flowers and roots	Burning, boiling	Topical and inhalation	5
9	<i>Euclea racemosa</i>	Small tree (≤ 12 m)*	Bark, roots and leaves	Decoction, infusions, poultice and burning	Oral, inhalation and topical	6
10	<i>Gazania rigens</i>	Groundcover (0.1 m – 0.5 m)***	Flowers, leaves and roots	Decoction, infusions and poultice	Oral and topical	8
11	<i>Harpephyllum caffrum Bernh</i>	Tree (≤ 15 m)*	Bark, fruit, roots and leaves	Burning and decoction	Topical, oral, chew and spit	8
12	<i>Helichrysum cymosum</i>	Groundcover (≤ 1 m)*	Whole plant, leaves and flowers	Burning, infusion, boiling and decoction	Oral, topical and inhalation	30
13	<i>Lycium ferocissimum</i>	Shrub (≤ 3 m)***	Leaves and roots	Boiling	Topical	4
14	<i>Mimusops caffra</i> A.DC	Tree (≤ 20 m)*	Bark and leaves	Decoction and infusions	Oral	6
15	<i>Oxalis pes-caprae</i> L.	Herb (≤ 0.3 m)*	Leaves, Stems, roots, and flowers	Raw and infusion	Oral, chew and spit	5
16	<i>Salvia africana-Lutea</i>	Shrub (≤ 2 m)*	Leaves and flowers	Boiling	Oral	10
17	<i>Searsia chirindensis</i>	Deciduous shrub (≤ 10 m)*	Bark, leaves and roots	Decoction	Oral	8
18	<i>Sideroxylon inerme</i>	Tree (3 m – 15 m)*	Bark, leaves, roots and fruit	Decoction and poultice	Oral and topical	11
19	<i>Silene undulata</i>	Perennial herb (≤ 0.6 m)*	Roots (rhizomes)	Decoction and infusions	Oral	9
20	<i>Tetragonia decumbens</i>	Sprawling shrub ($\leq 0.06 \times 0.06$ m)*	Leaves and stem	Boiling and decoction	Oral	8
21	<i>Tarchonanthus camphoratus</i>	Shrub (2 m – 9 m)*	Leaves and twigs	Infusions, burning and raw	Oral, topical and inhalation	27
22	<i>Wachendorfia thyrsiflora</i>	Herb (0.6 m – 2.5 m)*	Leaves and roots	Infusion	Oral and topical	5
23	<i>Zanthoxylum capense</i>	Shrub (4 m – 8 m)*	Leaves, fruit, roots and bark	Infusions, poultice and decoction	Oral and topical	7
24	<i>Ziziphus mucronata</i>	Tree (≤ 17 m)*	Leaves, bark and roots	Burning, decoction	Oral, topical	9

No., number; *, tall; **, wide; ***, tall and wide; m, meter.

TABLE 3: Medicinal uses, use value and the fidelity level of all the plants identified by the respondents.

Number	Plant name	Medicinal use(s)	Uv	FL (%)
1	<i>Aptenia cordifolia</i>	Hepatoprotective: liver infections Cardioprotective: heart failure and heart attack Anti-inflammatory: psoriasis, lupus and arthritis Aphrodisiac: low libido Phytoestrogenic: menopause symptoms, Reproductive tonic: infertility	0.26	77.8
2	<i>Bulbine frutescens</i>	Analgesic: wounds, burns, sores, cuts and scrapes Anti-fungal: ringworms Anti-inflammatory: mouth ulcers, eczema and acne Antiviral: cold sores Anti-diabetic: diabetes mellitus Hepatoprotective: hepatitis	0.34	75.0
3	<i>Burchellia bubalina</i>	Antimicrobial: diarrhoea, fever and common cold Emetic: cleansing the stomach Anti-inflammatory: arthritis Analgesic: headache and toothache	0.20	57.1
4	<i>Carissa edulis</i>	Antimicrobial: fever, diarrhoea, cold and gonorrhoea Anti-inflammatory: oedema, rheumatism Analgesic: toothache Neuroprotective: rabies and headache	0.26	66.7
5	<i>Carissa macrocarpa</i>	Antimicrobial: diarrhoea Analgesic: common cold, fever, toothache, earache, wounds and sores Anti-diabetic: diabetes Hepatoprotective: liver infection	0.26	77.8
6	<i>Carpobrotus edulis</i>	Analgesic: wounds, sores, tick bites, burns, headache, earache, toothache and sore throat Antimicrobial: acne, fever, tuberculosis Anti-diabetic: diabetes Anti-inflammatory: sinus and eczema	0.40	85.7
7	<i>Dasispermum suffruticosum</i>	Antimicrobial: fever and common cold. Analgesic: headache, Antiscorbutic: scurvy, Anti-coagulant: blood thinning Anti-cancer: cancer Cardioprotective: heart failure	0.20	42.9
8	<i>Eriocephalus africanus</i>	Antimicrobial: fever and cold Anti-inflammatory: arthritis Anti-diabetic: diabetes types 1 and 2 Anti-cancer: cancer:	0.14	60.0
9	<i>Euclea racemosa</i>	Anti-diabetic: diabetes mellitus Anti-cancer: cancer Analgesic: toothache, headache and earache Antimicrobial: diarrhoea	0.17	50.0
10	<i>Gazania rigens</i>	Hepatoprotective: liver infections Analgesic: toothache, eyeache, earache, sunburns, cold sores and insect bites Nephroprotective: kidney infection	0.22	75.0
11	<i>Harpephyllum caffrum</i>	Antimicrobial: acne, rash and diarrhoea Osteoprotective: bone fractures and osteoporosis Emetic: stomach cleansing Anti-inflammatory: eczema Depurative: blood cleanser	0.23	62.5
12	<i>Helichrysum cymosum</i>	Analgesic: headache, cuts and wounds Antimicrobial: fever, cold, influenza and diarrhoea Anti-inflammatory: sinus and congested nose Antispasmodic: menstrual problems Nephroprotective: liver infection Emetic: stomach cleansing Sedative: insomnia Orexigenic: appetite Osteoprotective: weak bones Antitussive: pulmonary problems and coughs Neuroprotective: dizziness Diuretic: urinary problems	0.46	100.0
13	<i>Lycium ferocissimum</i>	Anti-inflammatory: allergies and arthritis Antimicrobial: common cold Anticancer: cancer	0.11	50.0
14	<i>Mimusops caffra</i>	Analgesic: wounds, bruises and sores Emetic: stomach cleansing Antimicrobial: tuberculosis and diarrhoea	0.17	33.3
15	<i>Oxalis pes-caprae</i>	Anti-inflammatory: arthritis Analgesic: cuts, wounds and sores Laxative: bowel movements	0.14	60.0
16	<i>Salvia aurea</i>	Antimicrobial: common cold, influenza, headache, toothache and tuberculosis Antispasmodic: period-related problems, Phytoestrogenic: menopausal symptoms Antifibrotic: fibroids Reproductive tonic: infertility Aphrodisiac: low libido	0.29	70.0
17	<i>Searsia chirindensis</i>	Anti-cancer: cancer Cardioprotective: heart problems Anti-inflammatory: rheumatism Neuroprotective: mental disorder and instabilities Anti-diabetic: diabetes mellitus	0.14	40.0
18	<i>Sideroxylon inerme</i>	Osteoprotective: fractured bones and osteoporosis Antimicrobial: fever, diarrhoea and common cold Anti-inflammatory: sinus and arthritis Analgesic: wounds, toothache and cuts Anthelmintic: tapeworms	0.31	63.6
19	<i>Silene undulata</i>	Anti-psychotic: paranoia, delusions and hallucinations Antiviral: fever, influenza and common cold	0.17	50.0
20	<i>Tetragonia decumbens</i>	Anti-cancer: cancer, Analgesic: wounds, burns and sores	0.11	75.0

Table 3 continues on the next page →

TABLE 3 (Continues...): Medicinal uses, use value and the fidelity level of all the plants identified by the respondents.

Number	Plant name	Medicinal use(s)	Uv	FL (%)
21	<i>Tarchonanthus camphoratus</i>	Analgesic: wounds, cuts, abdominal pains, sores, headache and toothache Antimicrobial: fever and common cold Anti-inflammatory: congested nose and sinus Antitussive: bronchitis and coughs	0.34	75.0
22	<i>Wachendorfia thyrsiflora</i>	Antimicrobial: fever and diarrhoea Analgesic: stomachache Antiseptic: wounds and cuts	0.14	60.0
23	<i>Zanthoxylum capense</i>	Anti-cancer: cancer Antimicrobial: fever and common colds Carminative: flatulence Anti-convulsant: seizures Analgesic: toothache Antivenom/Analgesic: snakebites	0.20	71.4
24	<i>Ziziphus mucronata</i>	Antimicrobial: sore throat, acne, chlamydia and gonorrhoea Anti-inflammatory: eczema Analgesic: body pains and chest pains Antivenom/Analgesic: snake bites	0.26	66.7

Uv, use-value; FL, fidelity level.

with data derived from Table 3. As seen in Table 4, leaves were used 87.5% of the time to treat one or more of the reported diseases and ailments, with roots being the second highest part used (70.8%), followed by bark (33.3%), flowers (25%) and fruit and stem both (20.8%), and the whole plants (8.3%) were the least used in the preparation of herbal medicine.

Leaves and roots were reported to be the most frequently used parts in the preparation of herbal medicine to treat one or more of the cited diseases and ailments in this study, which is similar to the survey conducted by Hughes et al. (2015) and Sumardjo (2021), who observed that leaves were the most used parts in their study. According to Semenya, Potgieter and Tshisikhawe (2013), the notable use of these plant parts is attributed to the longstanding belief that they have greater healing contents than other parts. Furthermore, the leaf surface of a plant makes up the primary photosynthetic region and the most biochemically active part, and this boosts the formation of secondary metabolites, which contribute to its therapeutic properties (Ghorbani 2005). While plant roots, with their stable environment and low metabolic activity, store secondary metabolites with minimal fluctuation, leading to higher concentrations of bioactive compounds.

Preparation methods

Medicinal plants can be prepared in various methods for diverse applications. This study documented six preparation modes (Table 5), such as decoction (66.7%), boiling (25%), burning (29.2%), infusions (54.2%), poultice (20.8%) and raw consumption (8.3%). Decoction was identified to be the most commonly used mode of preparation, which can be easily achieved by boiling water with the specific plant part until the water volume is reduced to half of its initial volume to effectively extract the bioactive compounds and micronutrients. This observation is consistent with numerous previous studies, including the results of the study conducted by Amel et al. (2013) and Youbi et al. (2016). The widespread use of decoction is attributed to its effectiveness and easy preparation.

TABLE 4: Frequency of usage of plant parts to treat diseases and ailments.

Plant parts	n	%
Leaves	21	87.5
Stems	5	20.8
Roots	17	70.8
Bark	8	33.3
Whole plant	2	8.3
Fruit	5	20.8
Flowers	6	25.0

TABLE 5: Frequency of preparation methods for medicinal plants.

Preparation method	n	%
Decoction	16	66.7
Poultice	5	20.8
Boiling	6	25.0
Burning	7	29.2
Raw	2	8.3
Infusion	13	54.2

TABLE 6: Frequency of administration methods.

Administration method	n	%
Oral	21	87.5
Topical	11	45.8
Chew and spit	3	12.5
Inhalation	6	25.0

Administration methods

Herbal medicine is predominantly administered gastro-internally and/or dermally. Oral ingestion (87.5%) was the most prevalent administration method used in this survey (Table 6), with decoction and infusions the frequently utilised preparation methods. Erhabor, Idu and Udo (2013) and Kadir et al. (2014) reported the same observation in a similar survey in Nigeria and Bangladesh, respectively. Eleven plants were reported to be administered topically (45.8%), while 12.5% were consumed raw, either by chewing and/or chewing and spitting the leaves or roots; however, they are recorded with the same percentage in this study. Nasal inhalation was 25.0% of the time to administer herbal medicine in this study.

In this survey, it was reported that ailments such as gastrointestinal issues, headache, flu and cold were treated by oral ingestion of *E. africanus*, *Oxalis pes-caprae*, *Salvia lutea*,

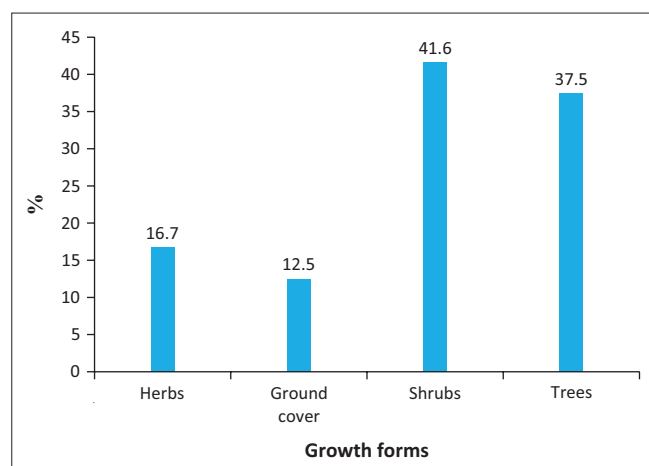


FIGURE 2: Growth forms of the plants recorded in this study.

Helichrysum cynosum, *Carissa macrocarpa* and *C. edulis* prepared by boiling, decoction or infusion. On the other hand, external issues, such as snake and tick bites, bone fractures, wounds, sores, rash, eczema and acne were treated by rinsing or smearing the affected area with a burnt and crushed *Ziziphus mucronata*, *Harpephyllum caffrum*, *C. edulis* powder. Each plant was reported to cure more than one disease/ailment, while different plants were also found to share common therapeutic applications, with varying fidelity levels. However, several studies have reported the toxicity of herbal and traditional medicines. Bose et al. (2021) attributed this toxicity to misidentification and authentication, incorrect standardisation or labelling, and contamination with fungal toxins such as aflatoxins. To address these risks, the World Health Organization recommends a series of toxicity assessments, including acute, chronic, local and specialised testing (Bose et al., 2021).

Growth forms of the plants documented in this study

Numerous studies in the previous years have reported herbs as the most common medicinal life forms. Few studies, including the recent surveys conducted by Falemara et al. (2021), reported trees as the most commonly used plant life form in the production of therapeutic remedies. This survey recorded shrubs (41.6%) as the prevalent life form used in the preparation of herbal medicine by the selected local communities in this study, followed by trees (37.5%), herbs (16.7%) and groundcover (12.5%) (see Figure 2). These findings are validated by the study carried out by Maroyi (2013), who documented trees and shrubs as equally predominant used life forms in the preparation of herbal medicine in Zimbabwe.

The frequent utilisation of shrubs over other life forms is attributed to their availability throughout the year because they are fairly drought-resistant and not affected by seasonal changes (Maroyi 2013). Shrubs have more foliage and aerial parts compared to herbs and groundcovers; therefore, the locals harvest sustainably without severely depleting the aerial parts, which might interfere with the

physiological functions, which in turn impacts the plants' ability to regenerate (Tugume et al. 2016).

Furthermore, shrubs play a vital role in ecosystem stability by preventing soil erosion, especially in the Eastern Cape, where degraded arable land is prevalent. Moreover, shrubs possess more secondary metabolites because of a larger surface than groundcovers or small herbs.

Conservation status of the selected plants in this study

The South African National Biodiversity Institute (SANBI) recognises the International Union for Conservation of Nature (IUCN) Red List as the global benchmark for assessing species' risk of extinction, and this framework is used in compiling the national Red List of South African plants (Fajinmi et al. 2023). The Red List provides an evidence-based assessment of extinction risk, highlighting species most urgently in need of conservation and protection. However, while its approach effectively prioritises threatened species, it does not emphasise those considered at low risk/least concerned. For example, according to SANBI records, 100% of the plants recorded in this study are classified as least concerned (LC) or under-utilised, yet species such as *Dasispermum suffruticosum* remain rare to find in their ecological habitats despite their LC. This is attributed to the combination of biological, ecological and anthropogenic factors, such as poor seed germination rate, competition with invasive species and habitat loss and degradation by human activities, respectively. Therefore, stricter regulatory measures need to be implemented to protect and conserve these species to ensure their continued availability for future generations and to support ongoing research and development related to their ethnobotanical and ethnomedicinal uses. Another two plant species that are not entirely underutilised in the Eastern Cape, as indicated by IUCN, are *H. cymosum* and *T. camphoratus* (camphor bush). These two plants form the backbone of traditional herbal medicine in the majority of rural communities, addressing a wide range of conditions, from minor ailments requiring analgesic relief to pulmonary conditions requiring antitussive action. Their efficacy has been validated by numerous studies. Fajinmi et al. (2023) also found that some of the highly and frequently utilised medicinal species may still be classified as 'Least Concern' because of their broad range of distribution, leading to overharvesting and affecting their conservation status.

The importance of medicinal plants for economic development

Globally, the demand for plant-derived products continues to rise, with the market for medicinal plants expected to reach approximately USD 450 billion (ZAR 7.98 trillion) by 2025 (WHO 2023). Historically, a number of blockbuster drugs have originated from plants, including morphine from *Papaver somniferum*, aspirin from *Salix cortex* and digoxin from *Digitalis purpurea*

(Nath et al. 2023), while in South Africa, species such as *Siphonochilus aethiopicus* (African ginger), *Aspalathus linearis* (rooibos), *Hoodia gordonii* (Bushman's hat) and *Agathosma betulina* (buchu) have successfully entered global markets.

In 1998, approximately 20000 tons of plant materials were traded, valued at around USD 38 million (Rasethe et al. 2019). In 2011, the South African bioprocessing sector, which includes both primary and secondary processing of indigenous plant resources, was valued at ZAR 482m, reflecting its growing contribution to national economic development (South African Department of Forestry, Fisheries and Environment n.d.). Beyond direct trade, the commercialisation of medicinal plants also supports the pharmaceutical, nutraceutical and cosmetic industries. This creates opportunities for job creation, innovation and bioprospecting investments, which contribute to both rural and national economies. For example, Meke et al. (2017) reported that over 90% of medicinal plant traders in central and southern Malawi earned more than 50% of their households' income through herbal medicine sales. However, the trade of these plants presents several challenges. Unsustainable harvesting has led to critical declines in some species; for instance, *Siphonochilus aethiopicus* is now classified as highly endangered in South Africa, largely extinct in the wild, and extremely rare because of extensive commercial exploitation in informal markets such as 'muthi' shops (Seile et al. 2022). Therefore, to prevent similar declines among the coastal flora recorded in this study, the cultivation of these plants, coupled with proper legislation and management strategies, is strongly encouraged.

Conclusion

This study investigated the extent of traditional knowledge regarding the use of indigenous medicinal plants for treating various human diseases/ailments in selected communities of the Eastern Cape Province. The Asteraceae and Aizoaceae families, with four and three species, respectively, were the most frequently cited groups, exhibiting the highest fidelity levels compared to other families. The remaining families, represented by one to two species each, were reported for treating more than four ailments and also demonstrated notable fidelity levels. In contrast, species such as *D. suffruticosum*, *Mimusops caffra*, and *Searsia chirindensis* were less cited, and according to the respondents, this is largely because of their rarity. This decline is attributed to anthropogenic pressures, including habitat destruction and unsustainable harvesting practices, which are exacerbated by weak land-use regulations and inadequate monitoring, as many indigenous taxa occur outside protected areas, thereby intensifying conservation challenges (Moreira et al. 2018). Rules and regulations on sustainable harvesting and conservation should be enforced, with harvesting restricted to trained community members under local council oversight. Policymakers should further promote their cultivation within these local communities for integration into the herbal and traditional medicine market. In addition, community development projects, private sector investments, and agro-

processing initiatives are encouraged to support these initiatives (Halilu 2022). Scientific validation of their bioactive compounds and safety remains a critical next step towards the discovery and development of novel pharmaceuticals. This calls for collaborative research not only in South Africa but across the African continent, to harness its diverse endemic flora – both to drive economic growth and safeguard public health against future pandemics.

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Competing interests

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Authors' contributions

Z.S. contributed to conceptualisation, methodology, investigation, data curation, formal analysis, writing (original draft), and review and editing of the article. G.B. was involved in methodology, formal analysis, software validation and writing (review and editing). H.W. was responsible for conceptualisation, supervision and funding acquisition.

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Data availability

All supporting data have been submitted as supplementary material along with the manuscript and are available from the corresponding author, H.W., upon reasonable request.

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References

- Adeleye, O.A., Femi-Oyewo, M.N., Bamiro, O.A., Bakre, L.G., Alabi, A., Ashidi, J.S. et al., 2021. 'Ethnomedicinal herbs in African traditional medicine with potential activity for the prevention, treatment, and management of coronavirus disease', *Future Journal of Pharmaceutical Sciences* 7(1), 72.

- Afolayan, A.J., Grierson, D.S. & Mbeng, W.O., 2014, 'Ethnobotanical survey of medicinal plants used in the management of skin disorders among the Xhosa communities of the Amathole District, Eastern Cape, South Africa', *Journal of Ethnopharmacology* 153(1), 220–232. <https://doi.org/10.1016/j.jep.2014.02.023>
- Albuquerque, U.P., Lucena, R.F., Monteiro, J.M., Florentino, A.T. & Almeida, C.D.F.C., 2006, 'Evaluating two quantitative ethnobotanical techniques', *Ethnobotany Research and Applications* 4, 51–60. <https://doi.org/10.17348/era.4.0.51-60>
- Amel, B., Cherifa, H., Madani, S. & Djamel, S., 2013, 'Herbalists and wild medicinal plants in M'Sila (North Algeria): An ethnopharmacology survey', *Journal of Ethnopharmacology* 148(2), 395–402. <https://doi.org/10.1016/j.jep.2013.03.082>
- Bose, S., Datta, R. & Kirlin, W.G., 2021, 'Toxicity studies related to medicinal plants', in S.C. Mandal, R. Chakraborty & S. Sen (eds.), *Evidence based validation of traditional medicines: A comprehensive approach*, pp. 621–647, Springer, Singapore.
- Dold, A.P. & Cocks, M.L., 2002, 'The trade in medicinal plants in the Eastern Cape province, South Africa', *South African Journal of Science* 98(11), 589–597.
- Erhabor, J.O., Idu, M. & Udo, F.O., 2013, 'Ethnomedicinal survey of medicinal plants used in the treatment of male infertility among the IFA Nkari People of Ini Local Government Area of Akwa Ibom State, Nigeria', *Research Journal of Recent Sciences* 2277, 2502.
- Esri, 2021, *ArcGIS desktop: Release 10.8.2*, Environmental Systems Research Institute, Redlands, CA.
- Fajinmi, O.O., Olarewaju, O.O. & Van Staden, J., 2023, 'Propagation of medicinal plants for sustainable livelihoods, economic development, and biodiversity conservation in South Africa', *Plants* 12(5), 1174. <https://doi.org/10.3390/plants12051174>
- Falemara, B.C., Joshua, V.I., Ogunkanmi, T.I. & Mbeng, W.O., 2021, 'Ethnomedicinal survey of indigenous medicinal plants in Jos Metropolis, Nigeria', *Journal of Medicinal Plants for Economic Development* 5(1), a128. <https://doi.org/10.4102/jomped.v5i1.128>
- Friedman, J., Yaniv, Z., Dafni, A. & Palewitch, D., 1986, 'A preliminary classification of the healing potential of medicinal plants, based on a rational analysis of an ethnopharmacological field survey among Bedouins in the Negev Desert, Israel', *Journal of Ethnopharmacology* 16(2–3), 275–287. [https://doi.org/10.1016/0378-8741\(86\)90094-2](https://doi.org/10.1016/0378-8741(86)90094-2)
- Ghorbani, A., 2005, 'Studies on pharmaceutical ethnobotany in the region of Turkmén Sahra, north of Iran (Part 1): General results', *Journal of Ethnopharmacology* 102(1), 58–68. <https://doi.org/10.1016/j.jep.2005.05.035>
- Govender, I., Rangiah, S., Kaswa, R. & Nzaumvila, D., 2021, 'Erratum: Malnutrition in children under the age of 5 years in a primary health care setting', *South African Family Practice* 63(3), a5416. <https://doi.org/10.4102/safp.v63i1.5416>
- Green, J. & Thorogood, N., 2018, *Qualitative methods for health research*, 4th edn., SAGE, London.
- Greene, A.M., Teixidor-Toneu, I. & Odonne, G., 2023, 'To pick or not to pick: Photographic voucher specimens as an alternative method to botanical collecting in ethnobotany', *Journal of Ethnobiology* 43(1), 44–56. <https://doi.org/10.1177/02780771231162190>
- Halilu, E.M., 2022, 'Cultivation and conservation of African medicinal plants for pharmaceutical research and socio-economic development', in S. Kumar (ed.), *Medicinal plants*, pp. 9–10, IntechOpen, London.
- Hosseinzadeh, S., Jafarikukhdan, A., Hosseini, A. & Armand, R., 2015, 'The application of medicinal plants in traditional and modern medicine: A review of Thymus vulgaris', *International Journal of Clinical Medicine* 6(9), 635–642. <https://doi.org/10.4236/ijcm.2015.69084>
- Hughes, G., Blouws, T., Aboyade, O., Davids, D., Oluchi, M., Charlotte, V.K. et al., 2015, 'An ethnobotanical survey of medicinal plants used by traditional health practitioners to manage HIV and its related opportunistic infections in Mpoza, Eastern Cape Province, South Africa', *Journal of Ethnopharmacology* 171, 109–115. <https://doi.org/10.1016/j.jep.2015.05.029>
- Hulley, I.M. & Van Wyk, B.E., 2019, 'Quantitative medicinal ethnobotany of Kannaland (Western Little Karoo, South Africa): Non-homogeneity amongst villages', *South African Journal of Botany* 122, 225–265. <https://doi.org/10.1016/j.sajb.2018.03.014>
- Kadir, M.F., Sayeed, M.S.B., Setu, N.I., Mostafa, A. & Mia, M.M.K., 2014, 'Ethnopharmacological survey of medicinal plants used by traditional health practitioners in Thanchi, Bandarban Hill Tracts, Bangladesh', *Journal of Ethnopharmacology* 155(1), 495–508. <https://doi.org/10.1016/j.jep.2014.05.043>
- Malterud, K., Siersma, V.D. & Guassora, A.D., 2016, 'Sample size in qualitative interview studies: Guided by information power', *Qualitative Health Research* 26(13), 1753–1760. <https://doi.org/10.1177/1049732315617444>
- Maroyi, A., 2013, 'Traditional use of medicinal plants in South-central Zimbabwe', *Journal of Ethnobiology and Ethnomedicine* 9(31), 1–18. <https://doi.org/10.1186/1746-4269-9-31>
- Meke, G.S., Mumba, R.F.E., Bwanali, R.J. & Williams, V.L., 2017, 'The trade and marketing of traditional medicines in southern and central Malawi', *International Journal of Sustainable Development & World Ecology* 24(1), 73–87. <https://doi.org/10.1080/13504509.2016.1171261>
- Modjadji, P. & Madiba, S., 2019, 'The double burden of malnutrition in a rural health and demographic surveillance system site in South Africa: A study of primary schoolchildren and their mothers', *BMC Public Health* 19(1), 1087.
- Moreira, M., Fonseca, C., Vergilio, M., Calado, H. & Gil, A., 2018, 'Spatial assessment of habitat conservation status in a Macaronesian island based on the InVEST model: A case study of Pico Island (Azores, Portugal)', *Land Use Policy* 78, 637–649. <https://doi.org/10.1016/j.landusepol.2018.07.015>
- Moyo, C., Mishi, S. & Ncwadi, R., 2022, 'Human capital development, poverty and income inequality in the Eastern Cape Province', *Development Studies Research* 9(1), 36–47. <https://doi.org/10.1080/21665095.2022.2032236>
- Mudau, F.N., Chimonyo, V.G.P., Modi, A.T. & Mabhaudhi, T., 2022, 'Neglected and underutilised crops: A systematic review of their potential as food and herbal medicinal crops in South Africa', *Frontiers in Pharmacology* 12, 809866. <https://doi.org/10.3389/fphar.2021.809866>
- Nath, R.A.J.A.T., Kityania, S.I.B.A.S.H.I.S.H., Nath, D.E.E.P.A., Talkudar, A.D. & Sarma, G.A.D.A.P.A.N.I., 2023, 'An extensive review on medicinal plants in the special context of economic importance', *Asian Journal of Pharmaceutical and Clinical Research* 16(2), 6–11. <https://doi.org/10.22159/ajpcr.2023.v16i2.46073>
- Olanipekun, M.K., Arowosegbe, S., Kayode, I.O. & Oluwale, T.R., 2016, 'Ethnobotanical survey of medicinal plants used in the treatment of women-related diseases in Akoko Region of Ondo-State, Nigeria', *Journal of Medicinal Plants Research* 10(20), 270–277.
- Rasethe, M.T., Semenya, S.S. & Maroyi, A., 2019, 'Medicinal plants traded in informal herbal medicine markets of the Limpopo Province, South Africa', *Evidence-Based Complementary and Alternative Medicine* 2019(1), 2609532. <https://doi.org/10.1155/2019/2609532>
- Rêgo, J.C.L., Soares-Gomes, A. & Da Silva, F.S., 2018, 'Loss of vegetation cover in a tropical island of the Amazon coastal zone (Maranhão Island, Brazil)', *Land Use Policy* 71, 593–601. <https://doi.org/10.1016/j.landusepol.2017.10.055>
- Seile, B.P., Bareetseng, S., Koitsiwe, M.T. & Aremu, A.O., 2022, 'Indigenous knowledge on the uses, sustainability, and conservation of African Ginger (*Siphonochilus aethiopicus*) among two communities in Mpumalanga Province, South Africa', *Diversity* 14, 192. <https://doi.org/10.3390/d14030192>
- Semenya, S., Potgieter, M.J. & Tshisikhawe, M., 2013, 'c', *African Journal of Biotechnology* 12(8), 2392–2405.
- South African Department of Forestry, Fisheries and Environment, n.d., *Bioprospecting economy*, Department of Environment, Forestry and Fisheries, viewed 05 September 2025, from <http://www.environment.gov.za/projectsprogrammes/bioprospectingeconomy>.
- Street, R.A. & Prinsloo, G., 2013, 'Commercially important medicinal plants of South Africa: A review', *Journal of Chemistry* 2013(1), 205048. <https://doi.org/10.1155/2013/205048>
- Sumardjo, A.F., 2021, 'Organic medical plants urban farming based on family empowerment on Bekasi, West Java', *Journal of Hunan University Natural Sciences* 47, 34–41.
- Tugume, P., Kakudidi, E.K., Buyinza, M., Namaalwa, J., Kamatenesi, M., Mucunguzi, P. et al., 2016, 'Ethnobotanical survey of medicinal plant species used by communities around Mabira Central Forest Reserve, Uganda', *Journal of Ethnobiology and Ethnomedicine* 12(5), 1–28. <https://doi.org/10.1186/s13002-015-0077-4>
- Van Wyk, B.E., 2015, 'A review of commercially important African medicinal plants', *Journal of Ethnopharmacology* 176, 118–134. <https://doi.org/10.1016/j.jep.2015.10.031>
- Willie, M.M. & Maqbool, M., 2023, 'Access to public health services in South Africa's rural Eastern Cape Province', *Applied Sciences Research Periodicals* 1(2), 35–54. <https://doi.org/10.2139/ssrn.4405870>
- World Health Organization (WHO), 2023, *WHO global report on traditional and complementary medicines 2023*, World Health Organization, Geneva.
- Wutich, A., Beresford, M. & Bernard, H.R., 2024, 'How many interviews are enough? An empirical investigation of data saturation across five qualitative research traditions', *International Journal of Qualitative Methods* 23, 1–16. <https://doi.org/10.1177/16094069241296206>
- Yeshiwas, Y., Tadele, E. & Tiruneh, W., 2019, 'The dynamics of medicinal plants utilization practice nexus its health and economic role in Ethiopia: A review paper', *International Journal of Biodiversity and Conservation* 11(1), 31–47. <https://doi.org/10.5897/IJBC2018.1201>
- Youbi, A.E.H.E., Ouahidi, I., Mansouri, L.E., Daoudi, A. & Boustia, D., 2016, 'Ethnopharmacological survey of plants used for immunological diseases in four regions of Morocco', *European Journal of Medicinal Plants* 13(1), 1. <https://doi.org/10.9734/EJMP/2016/12946>