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ETHNOBOTANICAL SURVEY OF HERBAL STEAM INHALATION (NYUNGU) IN ZANZIBAR: MEDICINAL PLANT USE, CULTURAL VALUE, AND TOURISM POTENTIAL

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Abstract

Background: Traditional herbal steam inhalation (Nyungu) is a key healthcare practice in Zanzibar for treating respiratory, febrile, and spiritual ailments. Despite its importance, it remains under documented and underutilized in wellness tourism. This study aimed to document the medicinal plants used in Nyungu and explore opportunities for integration into tourism.
Materials and Methods: A cross-sectional ethnobotanical survey was conducted in 26 shehias (14 in Unguja and 12 in Pemba). Sixty-eight traditional healers were purposively selected and interviewed using structured questionnaires. Data on plant use, preparation, treated ailments, and commercialization were analyzed using SPSS and Origin software.
Results: The study identified 73 and 75 plant species in Unguja and Pemba, respectively. Commonly cited species included *Citrus aurantiacus*, *Azadirachta indica*, and *Ocimum americanum*. The main ailments treated were runny nose (18%), fever (15%), common cold (13%), and spiritual disorders (12%). Treatment regimens varied: most healers in Unguja preferred one-day sessions, while those in Pemba favored three- to seven-day duration. Polyherbal preparations were widely used. Commercialization was limited, with 60% of healers in Unguja and 84% in Pemba not offering services to tourists. Documentation was low, as only 8% (Unguja) and 17% (Pemba) recorded their practices.
Conclusion: Nyungu remains a cornerstone of traditional healthcare in Zanzibar and holds promise for wellness tourism. However, poor documentation, limited commercialization, and lack of standardization hinder its development. Phytochemical validation, cultivation of key species, tourism integration, and supportive policies are recommended for sustainable use and cultural preservation.

Keywords: *Ethnobotany, Medicinal Plants, Wellness Tourism, Nyungu (Steam Inhalation), and Cultural Preservation*

List of Abbreviations: **ZAHRI** – Zanzibar Health Research Institute; **CGCLA** – Chief Government Chemist Laboratory Agency; **UNESCO** – United Nations Educational, Scientific and Cultural Organization; **ZFDA** – Zanzibar Food and Drug Agency; **SPSS** – Statistical Package for the Social Sciences; **THs** – Traditional Healers; **USD** – United States Dollar; **WHO** – World Health Organization; **COVID-19** – Coronavirus Disease 2019

Introduction

Traditional medicine, rooted in indigenous knowledge and practices, continues to play a pivotal role in primary healthcare across many developing nations, including Zanzibar (Baylor, 2015). In Zanzibar, traditional medicine is not only a cultural heritage but also a vital health resource due to the accessibility and affordability challenges associated with modern pharmaceuticals. Particularly, the practice of herbal steam inhalation, baths, or oral

preparations (Nyungu) has been a long-standing therapeutic approach employed for managing physical, mental, and spiritual ailments.

Globally, the therapeutic application of medicinal plants is gaining traction not just for healthcare but also for economic development. The global market for herbal medicines was estimated at USD 18 billion in 2005, with countries like China and India exporting tens of thousands of tonnes annually, while Europe remains a primary importer (Khan and Rauf, 2014). In Africa, and specifically in Zanzibar, traditional healers have historically relied on local biodiversity for the treatment of illnesses such as asthma, respiratory infections, fever, malaria, and even spiritual disorders (Louw *et al.,* 2002; Tabuti *et al.,* 2003; Olayiwola, 2021).

During the COVID-19 pandemic, when conventional medicine was still under development, communities in African nations turned to traditional plant-based remedies to alleviate symptoms and enhance immunity (Israt and Onay, 2020). This reaffirmed the relevance of conventional practices like Nyungu in managing respiratory and infectious diseases. Steam inhalation, as practiced in Nyungu, involves inhaling vapor infused with medicinal plant extracts and has been clinically recognized for alleviating symptoms of colds, flu, bronchitis, and sinusitis (Suresh, 2017).

In response to COVID-19, the Tanzanian Government has emphasized continuing with traditional medicine and religious practices according to each person's religion in solving COVID-19 problems (Mshana *et al.,* 2021). Strategically, this was conducted to reduce public fear and panic because there was a lack of medications for COVID-19, especially in Tanzania. It further provided psycho social stability and public attention in the finding of new medical solutions against COVID-19 (Mshana *et al*., 2021). In Tanzania, it is estimated that above 70% of the population uses traditional medicine in the treatment and control of different diseases (Kabyemela, 2020).

The systematic documentation, scientific validation, commercialization, and integration of this indigenous knowledge into formal health, tourism, and economic systems are all lacking, despite Zanzibar's pervasive reliance on traditional medicine, especially the Nyungu (steam inhalation) practice. The majority of Nyungu customs are still unrecorded in scientific literature, which restricts their preservation, standardization, and potential for wider health or financial gain, even though the survey found 148 species of medicinal plants used in Nyungu treatments and emphasized their use in treating fever, respiratory infections, and spiritual ailments. The current study documents medicinal plants used in the Nyungu practice and underscores the urgency of integrating Nyungu practices into formal wellness and tourism frameworks, advocating for conservation, cultivation of key species, and comprehensive research to promote sustainable utilization of Zanzibar’s valuable medicinal plant heritage.

Graphical Flowchart

(Study area → Healer selection → Questionnaire survey → Plant identification → Data analysis → Documentation and Recommendations)

Materials and Methods

Study area

This study was carried out in the Zanzibar Archipelago, which includes the islands of Unguja and Pemba. It is well-known for its rich biodiversity and long history of using medicinal plants. 26 Shehias (administrative wards) were specifically chosen due to their use of traditional medicine and the availability of skilled healers. Fourteen Shehias from both the southern and northern districts of Unguja were surveyed. Twelve Shehias were included in Pemba, especially isolated and ecologically diverse communities like Kojani and Kisiwapanza, where Nyungu (steam inhalation) customs are still widely practiced.

Data collection

The Unguja and Pemba islands of Zanzibar were both used for the data collection process. Based on the knowledge that traditional healing practices, especially Nyungu, are frequently carried out in these areas, a total of 26 shehias (administrative units) were purposefully chosen. Twelve shehias from Pemba and fourteen from Unguja are included in the breakdown. These shehias included, Mzuri Makunduchi, Bwejuu, Jambiani Kikadini, Dongwe, Ukongoroni, Unguja Ukuu Kaepwani, Tumbatu Uvivini, Fukuchani, Donge Mtambile, Bumbwini Makoba, Bweleo, Magomeni, Binguni and Ndijani for Unguja and Makangale, Kipange, Msuka Magharibi, Piki, Fundo, Kojani, Pujini, Vitongoji, Muwambe, Kisiwapanza, and Kiwani for Pemba

Village leaders and Traditional Healers (THs) were the target of the survey: Interviews were conducted with 68 Traditional Healers: Village leaders helped identify and choose skilled healers within each shehia, with 42 coming from Unguja and 26 from Pemba. Structured questionnaires were the main tool used to collect data. The ZAHRI research team created these specifically to gather pertinent ethnobotanical and practice-based data from the healers. The questionnaires were created to: Identify medicinal plants used in Nyungu (herbal steam baths and inhalations); Recognize the preparation and use of these plants; Document illnesses treated by these practices; Evaluate the extent of use for tourism and business; Examine documentation and knowledge-sharing practices among healers; and Document any known risks or side effects during Nyungu practice.

Data management and analysis

The research team handled all gathered data to guarantee data storage and security. The Kobo program was used to electronically gather data from traditional healers, which was then securely stored, and only authorized users could access it. Origin 8.5.1 software and the Statistical Package for the Social Sciences (SPSS) were used to analyze the data that was gathered. The research team managed the data to guarantee storage and security.

Results

The study explored Nyungu, a traditional steam inhalation and herbal bath therapy practiced in Unguja and Pemba, Zanzibar. A total of 68 traditional healers (42 from Unguja and 26 from Pemba) were interviewed using structured questionnaires across 26 shehias.

Common Diseases Treated by Nyungu

People of Zanzibar use Nyungu to treat different diseases, table 1, shows the most common disease treated by the medicinal plants used for Nyungu in Zanzibar.

Table 1: Percentages uses of Nyungu practice to treat different disease

Disease	Percentage (%)
Fever	15
Runny nose	18
Common cold	13
Spiritual disorders	12

Apart from the mentioned percentages of uses of Nyungu practice to treat the mentioned diseases in table 1, Nyungu practice also treats other diseases such as exhaustion, epilepsy, asthma, chest pain, COVID-19, stomachaches, body aches, and hallucinations.

The most common diseases treated by Nyungu in Unguja

Zanzibar islands faced with different diseases, people of Unguja specifical from rural areas use herbal medicines to treat diseases. Figure 1 of the present study shows the common diseases treated by Nyungu in Unguja, the outcome to treat the mentioned disease obtained from the survey conducted from the different traditional healers of Unguja.

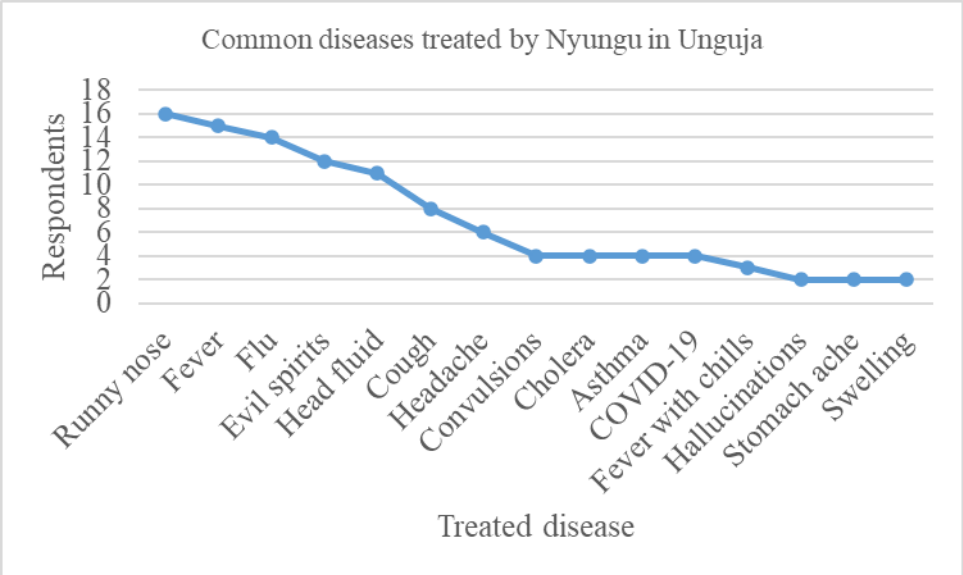

Figure 1: Common diseases treated by Nyungu in Unguja

Figure 2 of the present study shows the common diseases treated by Nyungu in Pemba, the outcome of treating the mentioned disease obtained from the survey conducted among the different traditional healers of Pemba.

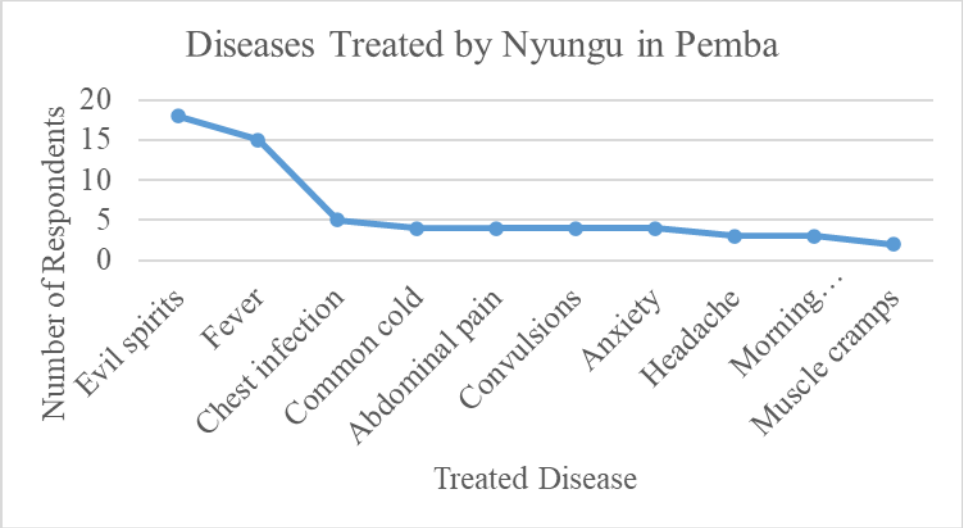

Figure 2: Common diseases treated by Nyungu in Pemba

Dosage Frequency of Nyungu Practice

According to the majority of respondents, the Nyungu practice usually lasts one day in Unguja. Seven-day, three-day, five-day, and fourteen-day durations follow this preference, indicating a general preference for shorter sessions. This pattern suggests that shorter Nyungu customs are more widely accepted or favored. The majority of respondents in Pemba indicate that the maximum dosage durations are seven days, three days, and five days. The number of Nyungu practice dosages that apply in Unguja is displayed in Figure 3 and the number of Nyungu practice dosages that apply in Pemba is displayed in Figure 4.

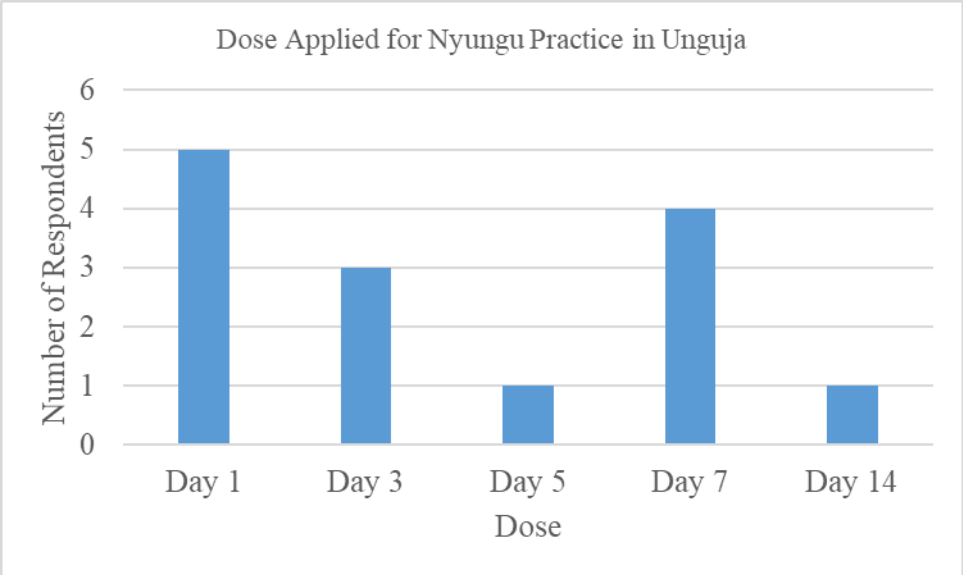

Figure 3: Dose applied for Nyungu Practice in Unguja

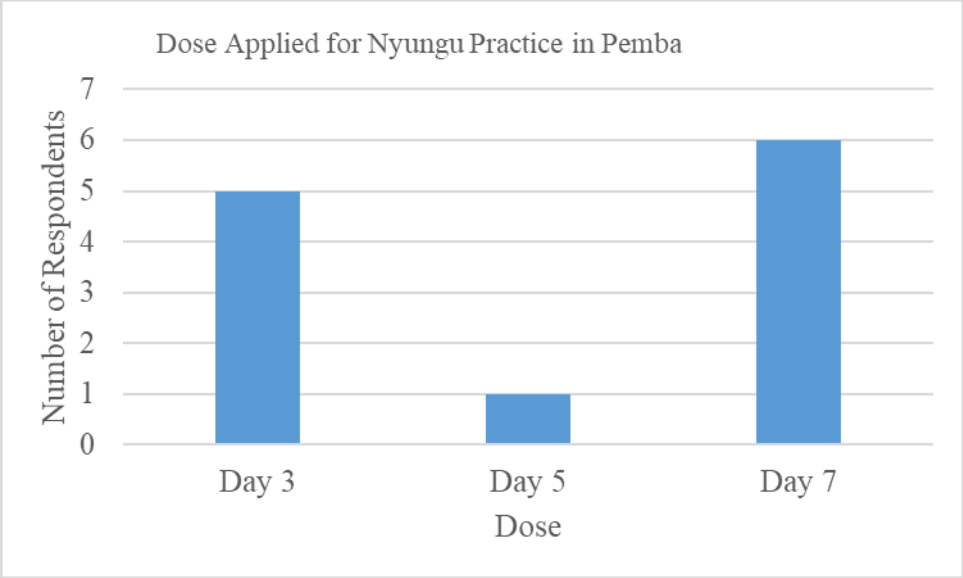

Figure 4: Dose applied for Nyungu practice in Pemba

Quantity of Plants Prepared to Manufacture Nyungu

Herbal medicine of Nyungu is composed of different plant species. Figures 5 and 6 below indicate the number of medicinal plants collected (prepared) for Nyungu practice in Unguja and Pemba, respectively.

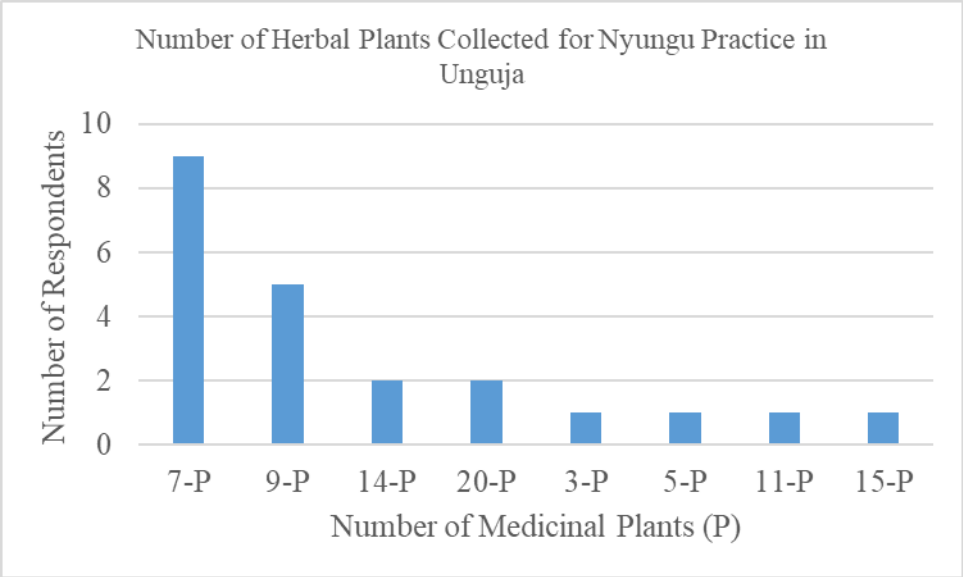

Figure 5: Number of medicinal plants prepared for Nyungu practice in Unguja

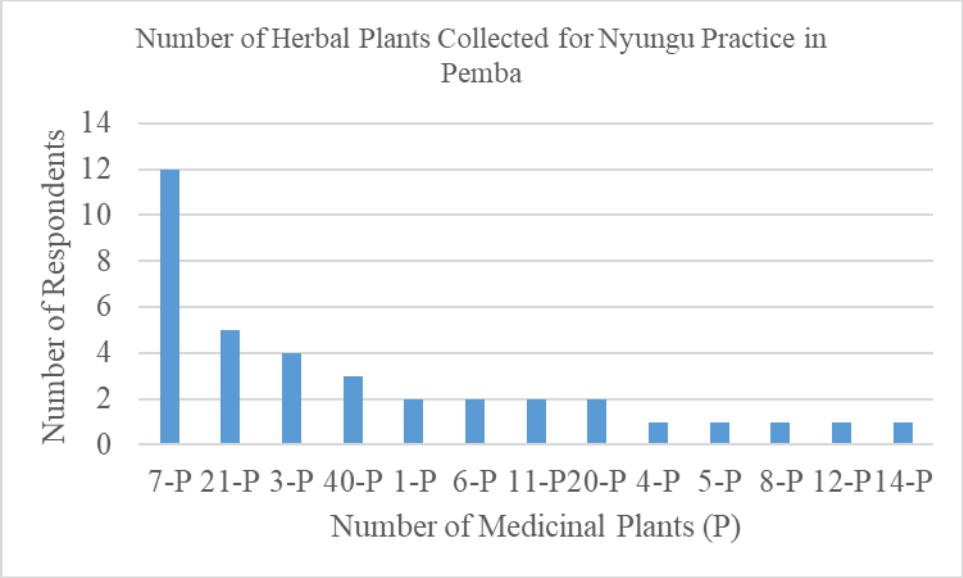

Figure 6: Number of medicinal plants prepared for Nyungu practice in Pemba

Nyungu Practice for Tourists

The study aimed to investigate the Nyungu practice for tourists in both Unguja and Pemba. The data depict that 60% and 84% of traditional healers in Unguja and Pemba, respectively, did not provide any service to Tourists, while 40% and 16% of tourists have been provided the practiced Nyungu services in Unguja and Pemba, respectively. Figures 7 and 8 represent the percentage of Nyungu services provided for tourists in Unguja and Pemba.

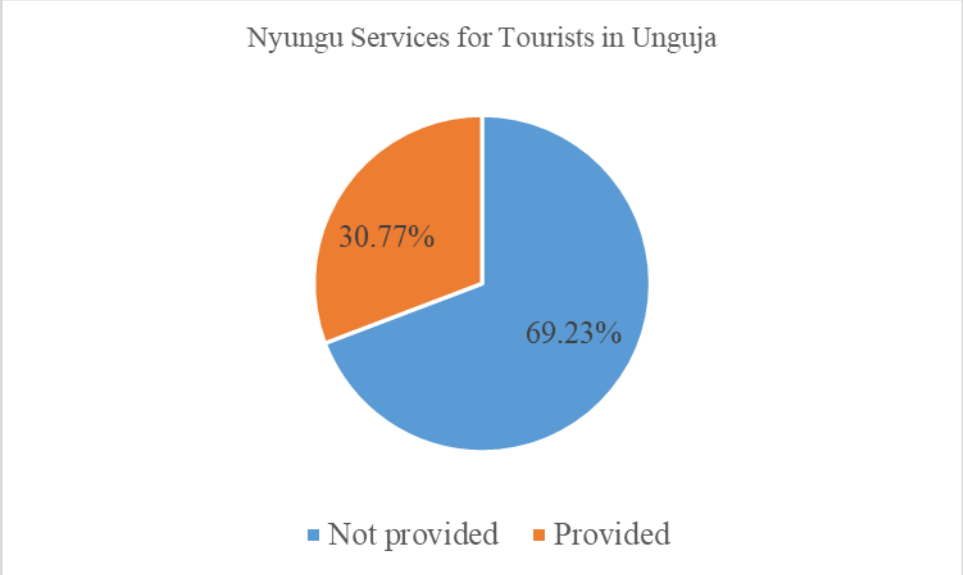

Figure 7: Nyungu Services for Tourists in Unguja

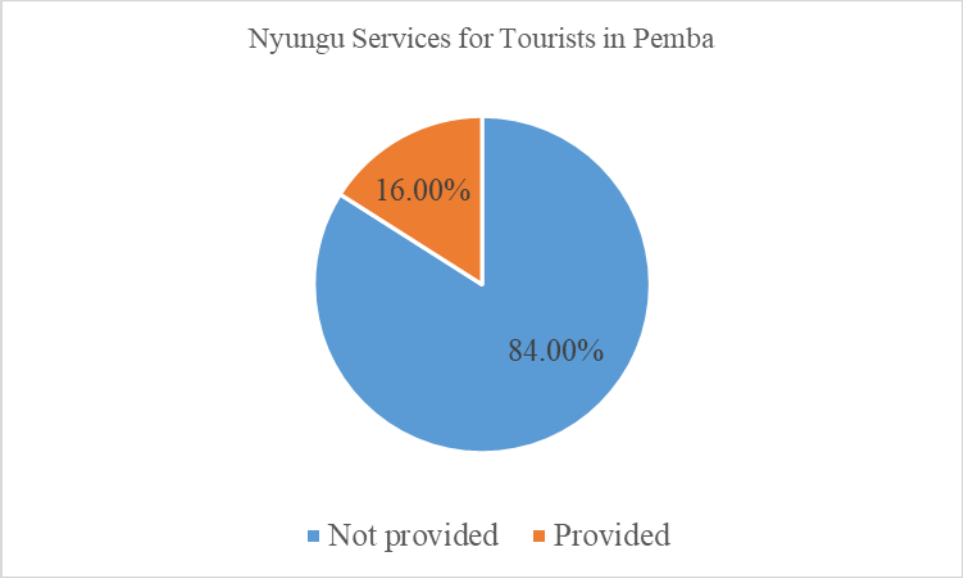

Figure 8: Nyungu Services for Tourists in Unguja

Nyungu as a Business

Furthermore, the study provides crucial information on how traditional healers engaged in the Nyungu practice business. Figures 9 and 10 below show the percentage of traditional healers' business engagement on Nyungu practice in Unguja and Pemba, respectively.

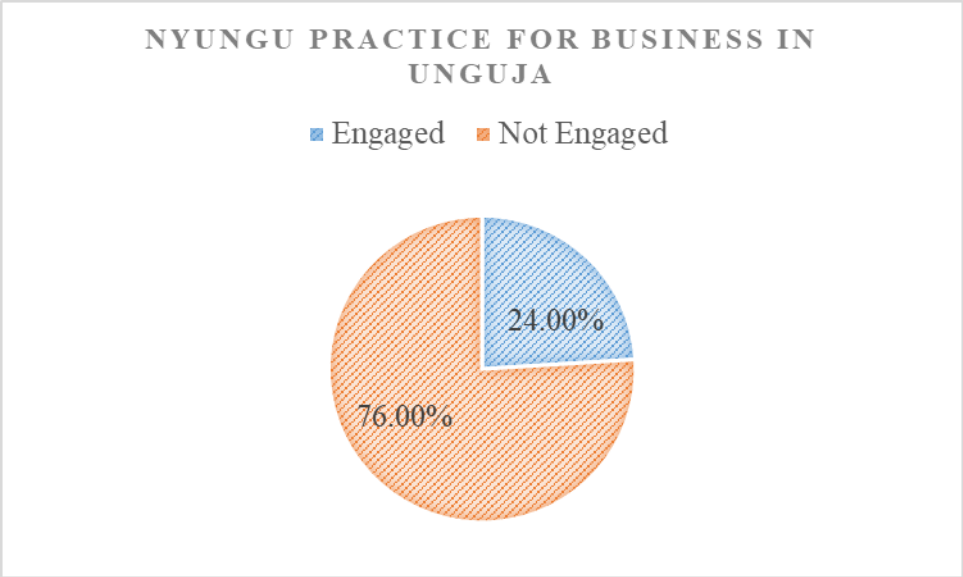

Figure 9: Nyungu practice for business purposes in Unguja

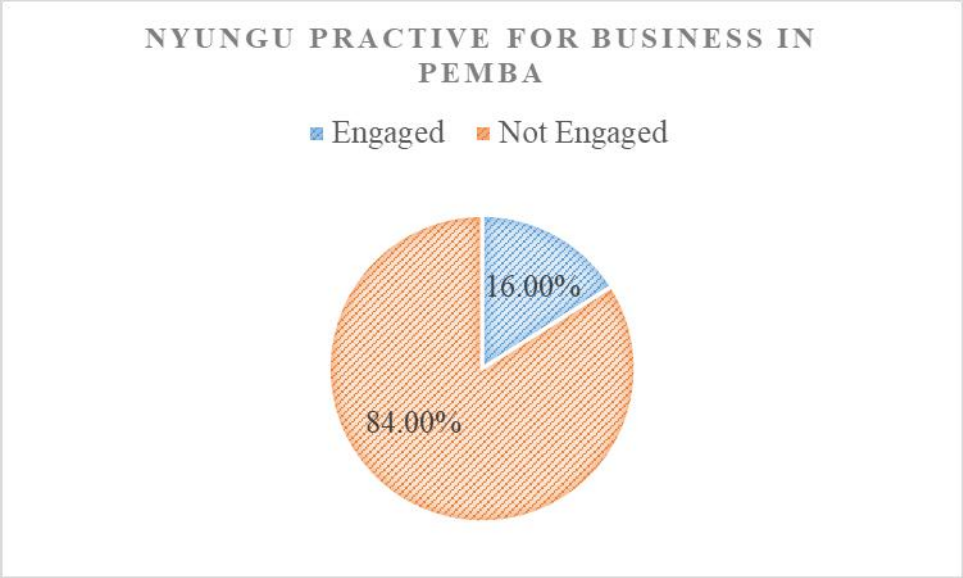

Figure 10: Nyungu practice for business purposes in Pemba

Documentation of Nyungu Plants

The data analyzed from the study indicated that only 8% and 17% in Unguja and Pemba, respectively, were documenting their medicinal plants, which they usually used in Nyungu "herbal medicinal bath" preparation. This lack of written records poses challenges for knowledge transfer and standardization. Figures 11 and 12 below show the percentage of traditional healers who document and do not document medicinal plants used for Nyungu practice in Unguja and Pemba.

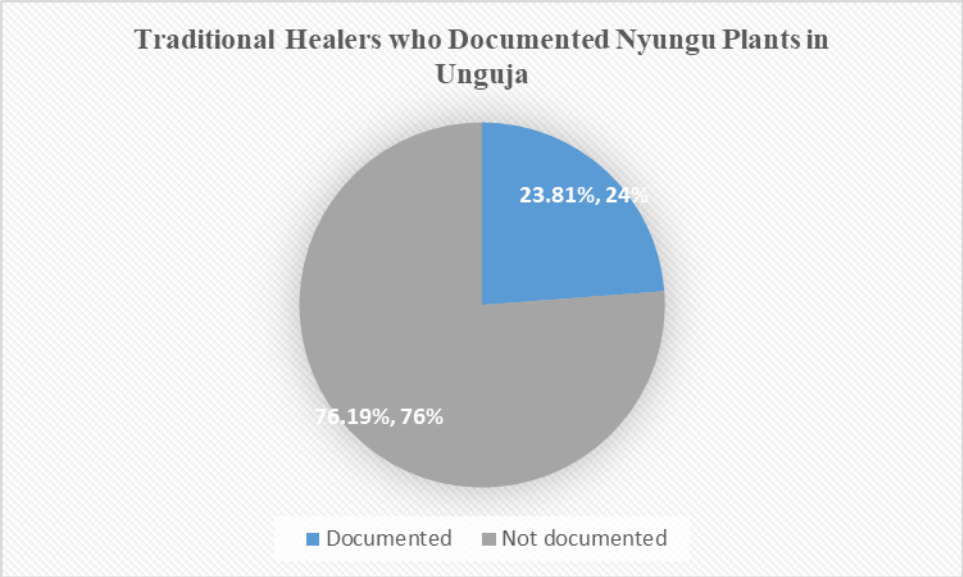

Figure 11: Traditional healers who documented Nyungu plants in Unguja

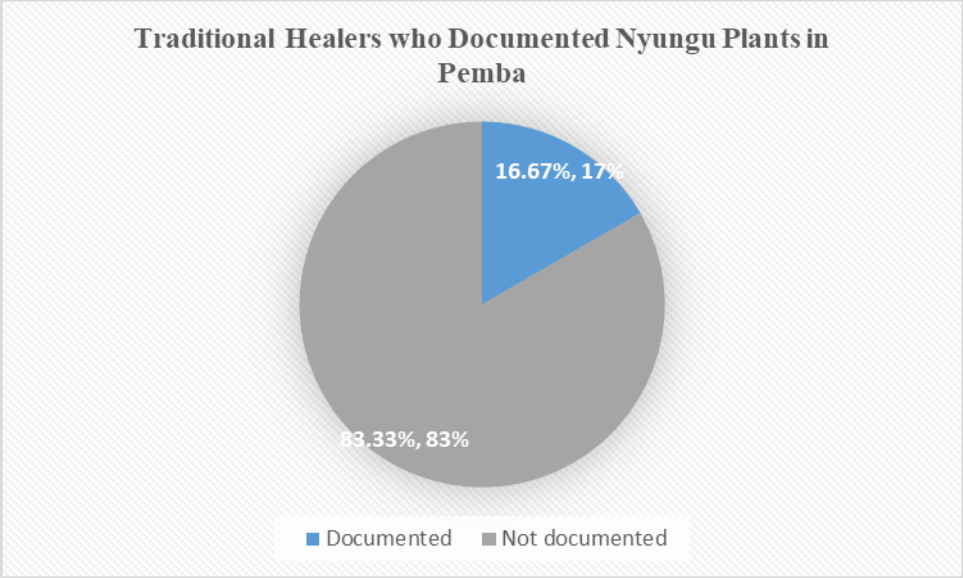

Figure 12: Traditional healers who documented Nyungu plants in Unguja

Discussion

Medicinal Plants Used in Nyungu Practice

The study's findings showed that 25 plant species were found in Unguja and 21 in Pemba, which were used to make herbal baths, Nyungu, and natural steam inhalation. The two islands' disparate plant species demonstrate the importance of localized ethnobotanical knowledge and regional biodiversity.

These findings are consistent with traditional medicine studies conducted in the East African region, where the choice of medicinal plants often varies according to geographical, cultural, and ecological factors (Kokwaro 2009 and Moshi *et al.* 2012). According to Moshi *et al*. (2012), in Tanzania, traditional healers from different regions use different types of plants to treat and control similar diseases due to the availability and diversity of knowledge transfer.

Furthermore, studies in Kenya and Uganda have shown that herbal steam inhalation and inhalation treatments are prepared using aromatic herbal blends, including species such as *Ocimum suave, Eucalyptus spp*., and Lippia javanica (Anywar *et al.* 2020). If such species were also found in this study, it would strengthen the shared ethnobotanical heritage of the East African region.

Common Diseases Treated by Nyungu

According to the study, *Nyungu* is used to treat a range of diseases, with the most common being runny nose (18%), fever (15%), common cold (13%), and spiritual disorders (12%). Other ailments include exhaustion, asthma, chest pain, epilepsy, stomachaches, and even COVID-19.

The application of Nyungu for respiratory issues (e.g., common cold, fever, asthma) is consistent with the pharmacological properties of aromatic and volatile compounds in medicinal plants used in steam inhalation (Abdullahi, 2011). Such compounds often include essential oils with antimicrobial and decongestant properties.
Interestingly, the inclusion of spiritual problems is consistent with findings from studies in West Africa and southern

Tanzania, where herbal steam treatments are believed to have physical and spiritual healing roles (Owuor and Kisangau, 2006; Ngarivhume *et al.,* 2015). In such settings, illnesses are sometimes thought to be caused by ancestral spirits or witchcraft, thus requiring the spiritual purification of herbs.

Dosage Frequency of Nyungu Practice

The results show that in Unguja, most respondents use a one-day Nyungu therapy, followed by sessions of three, five, seven, and fourteen days. In Pemba, most preferred longer durations (seven, five, or three days). The preference for shorter durations in Unguja might reflect modernization and time constraints among patients, or possibly the more urbanized lifestyle compared to Pemba.

These findings are consistent with other ethnopharmacological surveys that reported that the duration and intensity of traditional therapies often depend on the healer's diagnosis and cultural expectations (Tabuti *et al.,* 2003). However, the lack of standardized dosage protocols is a limitation commonly noted in herbal medicine practices (WHO, 2002).

Quantity of Plants Prepared for Nyungu

The number of plant species used per Nyungu session varies between Unguja and Pemba, with a general trend of using multiple plant species in one preparation. This polyherbal approach is typical in African traditional medicine, where synergy between plant constituents is believed to enhance efficacy and reduce toxicity (Gurib-Fakim, 2006). However, such practices complicate scientific validation and standardization efforts.

Nyungu Practice for Tourists

The study reports that 40% of healers in Unguja and 16% in Pemba provide Nyungu services to tourists. This shows a higher commercialization and exposure to tourism in Unguja, likely due to its more developed infrastructure and tourist flow.

Comparative studies in Ghana and Morocco indicate that traditional therapies are often marketed as wellness treatments to tourists, providing economic benefits and promoting cultural heritage (Bodeker and Kronenberg, 2002). However, it also raises ethical and regulatory questions concerning the quality, safety, and informed consent for such services.

Nyungu as a Business

Figures 9 and 10 suggest that traditional healers in both islands are increasingly engaging in the commercialization of Nyungu. This transition from purely therapeutic to economic practice mirrors trends observed in other African settings (Makinde *et al*., 2013). While commercialization improves accessibility and economic empowerment, it may also lead to overharvesting of medicinal plants, endangering biodiversity.

Documentation of Nyungu Plants

Alarmingly, only 8% of traditional healers in Unguja and 17% in Pemba of traditional healers documented the plant species they used. This poses a serious threat to cultural continuity and scientific research. Without written records, valuable indigenous knowledge may be lost as older healers pass away (Martin, 1995 and WHO, 2002).

Documentation and digital databases have been advocated by many scholars as essential for the preservation of indigenous knowledge and integration with modern medicine (Hamilton, 2004). Initiatives like the African Herbal Pharmacopeia aim to bridge this gap.

Conclusion

This study provides vital insights into the traditional *Nyungu* practice in Zanzibar, highlighting both its cultural significance and the challenges it faces in documentation, standardization, and integration with modern health systems. The comparison between Unguja and Pemba reveals differences in practice, plant selection, and commercialization trends, reflecting ecological and socio-cultural influences. To ensure the sustainability and scientific credibility of Nyungu, greater emphasis should be placed on plant documentation, dosage standardization, and collaboration between traditional healers and researchers.

Recommendations

According to the study's findings, traditional healers in Zanzibar typically use a variety of medicinal plants. Even though this study yielded some useful information, the researchers should primarily take into account the following suggestions for future research:

- Further studies should be carried out on the identification of more plant species practiced for Nyungu preparation in Zanzibar
- Phytochemical screening and other biological studies of medicinal plants identified from this survey should be conducted.
- More education should be provided to society on plant conservation for future generations.
- Education should be provided to the communities to improve Knowledge on the use of medicinal plants for the treatment of disease, as well as Nyungu preparations.
- The government should emphasize documenting the traditional knowledge from our traditional healers to preserve it from one generation to another
- The government should encourage people to cultivate more medicinal plants to reduce the scarcity of the species.

Study Limitations

While this study provides a foundational documentation of Nyungu practices in Zanzibar, several limitations should be considered when interpreting the results:

a) **Sampling Bias:** The use of purposive sampling, while necessary to identify knowledgeable traditional healers, means the findings may not be fully representative of all Nyungu practitioners in Zanzibar. Healers in more remote shehias or those who are less known to village leaders may have been omitted, potentially overlooking unique knowledge.
b) **Reliance on Self-Reported Data:** The data are based on the interviews and recall of the traditional healers. This introduces the possibility of recall bias, where healers may have forgotten, omitted, or inadvertently misrepresented details about plant use, dosages, or treated ailments.
c) **Taxonomic Identification:** The study lists plants by their common names (e.g., *Mchungwa*, *Mwarobaini*). Without voucher specimen collection, deposition in a herbarium, and precise botanical identification, there is a risk of misidentification. Different species may share common names, which could affect the accuracy of the plant use data and any future pharmacological studies.
d) **Lack of Phytochemical and Pharmacological Data:** This was an ethnobotanical survey. It documents *use* but does not provide scientific evidence for the efficacy or safety of the documented preparations. The recommendations for validation are based on this identified gap.
e) **Cultural and Linguistic Barriers:** Despite the best efforts of the local research team, nuances in spiritual beliefs and highly specialized knowledge may not have been fully captured or translated using a structured questionnaire.
f) **Cross-Sectional Design:** As a snapshot in time, this study documents current practices but cannot track the evolution, loss, or adaptation of Nyungu knowledge over time.

Conflict of Interest:
The authors that there is no conflict of interest associated with this study.

Acknowledgments

Thankful to the Director General of Zanzibar Health Research Institute (ZAHRI), Dr. Mayassa Salum Ali, for her great support, and also, we extend our sincere gratitude to the traditional healers of Zanzibar for generously sharing their knowledge and practices, which formed the foundation of this study. We also acknowledge the support of village leaders, local authorities, and research assistants who facilitated data collection. Special thanks to the Zanzibar Health Research Institute (ZAHRI), the Ministry of Health in Zanzibar, and other collaborating institutions for their technical and logistical assistance.

ANNEXES

ANNEX 1: Plant Species Distribution in Unguja and Pemba Islands

Zone	Location	Species names
Unguja – South	Makunduchi Mzuri	*Acridocarpus zanzibaricus, Adansonia digitata, Agathisanthemum bojeri, Azadirachta indica, Cajanus cajan, Celtis drandii, Citrus aurantiacus, Citrus limonia, Clausena anisata, Cordia alliodora, Croton sylvaticus, Dichrostachys cinerea, Drypetes natalensis, Flacourtia indica, Jasminum odoratissimum, Lauracia cornuta, Manihot esculenta, Murraya koenigii, Ocimum americanum, Ocimum canum, Plectranthus barbatus, Psidium guajava, Sida acuta, Solanum incanum, Suregada zanzibariensis, Uvariodendron kirkii*
Unguja – South	Kizimkazi Dimbani	*Celtis drandii, Citrus aurantiacus, Clausena anisata, Cordia alliodora, Croton pseudopuchellus, Croton sylvaticus, Dodonea viscosa, Drypetes natalensis, Lantana camara, Lauracia cornuta, Lippia asperifolia, Mallotus opposifolius, Murraya koenigii, Ocimum americanum, Ocimum canum, Panicum trichocladum, Sorindeia madagascariensis, Suregada zanzibariensis, Terminalia catappa, Turea floribunda, Uvariodendron kirkii*
Unguja – South	Bwejuu	*Acridocarpus zanzibaricus, Cajanus cajan, Casuarina equisitufolia, Citrus aurantiacus, Clausena anisata, Croton sylvaticus, Cymbopogon citratus, Dalbegia vaccunifolia, Dichrostachys cinerea, Dodonae angustifolia, Dombeya cincinnata, Eugenia spp, Flacourtia indica, Macphersonia gracilis, Mallotus opposifolius, Mytenus mossambicensis, Ocimum americanum, Ocimum basilicum, Ocimum canum, Ozoroa obovata, Pitosporum viridiflorum, Rhus longipes, Suregada zanzibariensis, Terminalia catappa, Turea floribunda, Uapaca guineensis, Uvariodendron kirkii, Vetiveria zizanoides*
Unguja – South	Dongwe	*Antidesma membranaceum, Cassia occidentalis, Casuarina equisitufolia, Celtis drandii, Chassalia parvifolia, Citrus aurantiacus, Clausena anisata, Dalbegia vaccunifolia, Dichrostachys cinerea, Dodonae angustifolia, Flacourtia indica, Lantana camara, Milicia excelsa, Mytenus mossambicensis, Ocimum americanum, Ocimum canum, Ozoroa obovata, Pitosporum viridiflorum, Polysphaeria parvifolia, Rhus longipes, Suregada zanzibariensis, Syzygium cumini, Terminalia boivinii, Trema orientalis, Uapaca guineensis, Uvariodendron kirkii*
Unguja - Central	Ukongoroni	*Acacia mellifera, Celtis drandii, Citrus aurantiacus, Clausena anisata, Dodonae angustifolia, Eugenia spp, Ocimum basilicum, Ocimum canum, Pitosporum viridiflorum, Sorindeia madagascariensis, Todalia asiatica, Trema orientalis, Uvariodendron kirkii*
Unguja - Central	Unguja Ukuu Kaepwani	*Achyranthes aspera, Croton sylvaticus, Dodonae angustifolia, Flueggea virosa, Lantana camara, Lippia asperifolia, Mallotus opposifolius, Murraya koenigii, Ocimum americanum, Ocimum canum, Rhoicissus revoilii, Suregada zanzibariensis, Tarenna pavettoides, Uvariodendron kirkii, Vitex doniana*
Unguja - North A	Tumbatu Uvuvini	*Abrus precatorius, Achyranthes aspera, Annona senegalensis, Cajanus cajan, Cassia abbreviata, Cassytha filliformis, Colubrina asiatica, Croton*

		pseudopulchellus, Croton sylvaticus, Drypetes natalensis, Flacourtia indica, Flueggea virosa, Gossypium sp., Lantana camara, Mallotus opposifolius, Markhamia sansibarica, Monanthotaxis fornicta, Murraya koenigii, Ocimum americanum, Plectranthus barbatus, Psidium guajava, Ricinus communis, Suregada zanzibariensis, Tamarindus indica, Tarenna pavettoides, Vitex doniana
Unguja - North A	Fukuchani	*Abrus precatorius, Annona senegalensis, Antidesma membranaceum, Azadirachta indica, Ceiba pentandra, Citrus limonia, Clausena anisata, Lantana camara, Lippia javanica, Mallotus opposifolius, Monanthotaxis fornicta, Ocimum americanum, Polysphaeria parvifolia, Ricinus communis, Trema orientalis*
Unguja - North B	Bumbwini Makoba	*Avicenia marina, Azadirachta indica, Clerodendrum glabrum, Croton pseudopulchellus, Croton sylvaticus, Cymbopogon citratus, Eugenia caryophyllus, Lantana camara, Mallotus opposifolius, Morus alba / M. rubra, Murraya koenigii, Ocimum americanum, Ocimum basilicum, Ocimum canum, Oldenlandia bojeri / Pentas purpurea, Polysphaeria parvifolia, Rhus longipes, Sorindeia madagascariensis, Suregada zanzibariensis*
Unguja - North B	Donge Mtambile	*Annona senegalensis, Cajanus cajan, Citrus aurantiacus, Clausena anisata, Mallotus opposifolius, Ocimum americanum, Ricinus communis*
Unguja - Urban	Magomeni	*Cassia fistula, Cassia occidentalis, Citrus aurantiacus, Clausena anisata, Croton pseudopuchellus, Eucalyptus spp, Harungana madagascariensis, Mallotus opposifolius, Ocimum americanum, Ocimum basilicum, Ocimum canum, Plectranthus barbatus, Suregada zanzibariensis*
Unguja – Urban	Nyerere kwa Wazee	*Citrus aurantiacus, Clausena anisata, Croton sylvaticus, Ocimum americanum, Ocimum basilicum, Ocimum canum, Sterculia africana, Suregada zanzibariensis, Toddalia asiatica, Uvariodendron kirkii*
Unguja – West	Bweleo	*Citrus aurantiacus, Cordia alliodora, Croton pseudopuchellus, Dodonae angustifolia, Lippia asperifolia, Ocimum americanum, Ocimum canum, Psidium guajava, Suregada zanzibariensis, Tarenna pavettoides, Toddalia asiatica, Uvariodendron kirkii*
Pemba - Micheweni	Makangale	*Abrus precatorius, Cajanus cajan, Cymbopogon citratus, Dichrostachys cinerea, Drypetes natalensis, Ethulis conyzoides, Flacourtia indica, Lantana camara, Murraya koenigii, Ocimum americanum, Ocimum basilicum, Ocimum canum, Phyllanthus niruri, Sclerocarya caffra, Securinega virosa, Uvariodendron kirkii, Zingiber officinale*
Pemba - Micheweni	Kipange	*Cajanus cajan, Drypetes natalensis, Flueggea virosa, Jatropha curcas, Ocimum americanum, Phyllanthus niruri, Plectranthus barbatus, Solanum incanum, Vitis spp.*
Pemba - Micheweni	Msuka Magharibi	*Adansonia digitata, Annona muricata, Avicenia marina, Azadirachta indica, Cassia spp, Cassytha filliformis, Clausena anisata, Cremaspora trifolia, Datura metel, Dodonae angustifolia, Ethulis conyzoides, Lantana camara, Lippia javanica, Ocimum basilicum, Phyllanthus niruri, Psidium guajava, Punica granatum, Ziziphus mucronate*
Pemba - Micheweni	Piki	*Cymbopogon citratus, Eugenia caryophyllus, Gossypium sp., Hibiscus surratensis, Ocimum americanum, Ocimum basilicum, Ocimum canum, Phyllanthus niruri, Securinega virosa, Vernonia*

		hildebrandtii
Pemba - Micheweni	Fundo	*Achyranthes aspera, Cajanus cajan, Cassia spp, Dodonae angustifolia, Drypetes natalensis, Ficus natalensis, Flacourtia indica, Flagellaria guineensis, Flueggea virosa, Keetia zanzibarica, Mimosa pudica, Ocimum americanum, Ocimum canum, Phyllanthus niruri, Piper betel, Securinega virosa, Tamarindus indica, Trichilia roka, Turraea nilotica, Uvariodendron kirkii*
Pemba - Micheweni	Kojani	*Abrus precatorius, Adansonia digitata, Azadirachta indica, Citrus aurantiacus, Citrus limonia, Clausena anisata, Dodonae angustifolia, Drypetes natalensis, Tamarindus indica, Vernonia hildebrandtii*

Annex II: Some of the plant species used in the Nyungu preparation for the current study

Local name	Scientific name
Kifuuho/Kifugu	*Mystroxylon aethiopicum*
Mzalia nyuma	*Phyllanthus niruri*
Mpacha	*Vernonia hildebrandtii*
Nchungarumi/Mchunga mwitu	*Teclea nobilis*
Mlala/Mlazalaza	*Abrus precatorius*
Mvumbafi/Kivumbasi	*Ocimum spp*
Haung'ong'wa	*Sychotria capensis*
Muinga jinni	*Volcameria glabra*
Muegeleka/Muegea	*Kigelia Africana*

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