

Article

Ethnobotanical Investigation of *Mimusops zeyheri*, an Underutilized Indigenous Fruit Tree in Gauteng Province, South Africa

Maropeng Erica Matlala ¹, Peter Tshepiso Ndhlovu ^{1,*} , Salmina N. Mokgehle ²  and Wilfred Otang-Mbeng ¹

¹ School of Biology and Environmental Sciences, Faculty of Agriculture and Natural Sciences, University of Mpumalanga, Private Bag X11283, Mbombela 1200, South Africa; 220207089@ump.ac.za (M.E.M.); wilfred.mbeng@ump.ac.za (W.O.-M.)

² School of Agricultural Sciences, Faculty of Agriculture and Natural Sciences, University of Mpumalanga, Private Bag X11283, Mbombela 1200, South Africa; salmina.mokgehle@ump.ac.za

* Correspondence: tshepiso.ndhlovu@ump.ac.za; Tel.: +27-01-3002-0393

Abstract: In developing countries, the livelihoods of millions of households heavily rely on wild fruit products to meet their basic needs. With its many nutritious assets, *Mimusops zeyheri* could, therefore, be valued as a natural resource for fighting hunger, poverty, malnutrition and food insecurity in developing countries. Indigenous fruit trees remain underutilized and harvested in the wild, with few cultivated sustainably. The study aimed to explore and document the various uses of *M. zeyheri*. Using face-to-face, semi-structured questionnaires, an ethnobotanical survey was collected among 53 participants using purposive sampling in the City of Tshwane Metropolitan Municipality. Descriptive statistics and ethnobotanical indices, such as Use Value (UV) and Relative Frequency of Citation (RFC), were used for analysis. *M. zeyheri* was reported to have various uses, which included but was not limited to food and medicine. It was found that the most commonly used plant components were fruits (47%) and leaves (22%). Decoction (39%) was the most popular method of preparation. *M. zeyheri* has become scarce in the surveyed communities, presumably due to extensive habitat destruction caused by population increases. Therefore, due to its scarcity, it does not significantly improve the livelihoods or overall well-being of local communities. This study suggests that *M. zeyheri* could improve food and economic security if thoroughly investigated and cultivated on a large scale.

Keywords: food security; livelihoods; medicinal value; preservation; traditional importance



Citation: Matlala, M.E.; Ndhlovu, P.T.; Mokgehle, S.N.; Otang-Mbeng, W. Ethnobotanical Investigation of *Mimusops zeyheri*, an Underutilized Indigenous Fruit Tree in Gauteng Province, South Africa. *Sustainability* **2024**, *16*, 1410. <https://doi.org/10.3390/su16041410>

Academic Editors: Samanta Zelasco and Luca Lombardo

Received: 20 November 2023

Revised: 23 January 2024

Accepted: 29 January 2024

Published: 7 February 2024



Copyright: © 2024 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Introduction

In recent years, there has been a dramatic increase in research into indigenous knowledge systems (IKS) [1]. Indigenous knowledge (IK) refers to the knowledge common to a specific community or group living in a specific area, derived from their forefathers' experiences [2]. This knowledge is considered highly valuable, and if not safeguarded, it can be lost forever [1,3]. With the emergence of the knowledge economy, knowledge has become the key source for social progress and economic growth and sustainability [4].

Previous studies have also emphasized the significance of indigenous food for the health and nutrition of the humans [1,5–7]. Most indigenous foods contain significant nutrients, which can potentially contribute to the daily nutrient intake, especially for people from lower socio-economic backgrounds [8,9]. Moreover, indigenous foods are integral to cultural heritage and are highly valued by local people [1]. Not only are these indigenous fruit trees significant to the cultural identity of local people and their livelihoods, but they also play an important ecological role [10]. Therefore, it is imperative that we recognize and understand the significance of indigenous fruit trees in the larger ecosystem, as it will provide possibilities for us to identify opportunities for conservation and sustainable

management. Research is being conducted to identify indigenous foods, their nutritional composition and various uses. However, much remains to be explored and understood [11].

Despite the wide variety of nutrient-rich indigenous fruit trees that can sustain human life, our global food systems are mainly dominated by a few plant crops [12–14]. These underutilized crops significantly reduce global hunger and poverty, but they cannot provide the entire range of nutrients humans require for a healthy life. Therefore, depending on them may potentially contribute to food insecurity [15]. Due to this, we need a diet that is far more diverse. Many underutilized tree species are rich in nutrients and bioactive compounds and could help diversify diets and address nutrient deficiencies in communities [16–18]. Furthermore, with the alarming increases in human populations, urbanization and climate change, food security has become a serious problem in many developing nations [19]. Food security exists when all individuals have access to adequate, safe and healthy food, regardless of their physical, economic and social circumstances. Conversely, food insecurity refers to the inability to access good and healthy food, and it can go to the extent of “hidden hunger”, recognized as a deficiency in micronutrients [9]. “Hidden hunger” can have devastating effects, leading to poor health and sometimes even death [20]. Additionally, it can also impede socio-economic development in developing countries. Today, the primary concern of the food and agricultural sector is to provide enough nutritional needs for the growing population, while conserving natural resources for future generations [21]. Therefore, using other potential food sources, such as indigenous fruit tree species, is essential.

The adoption and utilization of indigenous knowledge is declining, mainly due to increased rural-urban migrations, industrialization, the loss of natural habitats, lifestyle changes and the demise of knowledge holders [22]. Therefore, recording ethnobotanical information about important indigenous trees is essential for preserving indigenous knowledge. This documentation will allow us to spread awareness of the significance of indigenous trees and promote their widespread cultivation to ensure their contributions to food and income security. If cultivated on a large scale, the nutrient-rich *M. zeyheri* fruits will provide a valuable source of food to local people. In addition, the tree is also resilient in arid conditions and can therefore contribute to sustainable agriculture in challenging environments. The cultivation of this tree could create economic opportunities, generating income for the communities that are involved in the cultivation, processing and marketing of this tree species. Locals can sell its products at small and large markets. Furthermore, its potential medicinal properties could also open pathways for pharmaceutical developments, adding another layer to its economic impact.

2. Materials and Methods

2.1. Geographical Position of the Research

This study was conducted across three communities (Ga-Rankuwa, Mabopane and Soshanguve) in the City of Tshwane Metropolitan Municipality in Gauteng province, South Africa (Figure 1). The selected municipality lies between 25° South and 28° East of Gauteng province, covering 6298 km² surface area. Incorporating the city of Tshwane, the municipality stands as the capital city of the republic of South Africa and is constantly growing. Gauteng province is the smallest province in South Africa, sharing its boundaries with North West, Free State, Limpopo and Mpumalanga. This province is also highly urbanized. The City of Tshwane municipality is situated north of the province and is one of the single-largest municipality in the country, with approximately 2.9 million inhabitants [23]. This district is situated in the country region that receives summer rainfall, and it is home to the grassland and savanna biome [24]. This region has an average temperature of 29 °C and receives approximately 622 mm of rainfall annually [25,26].

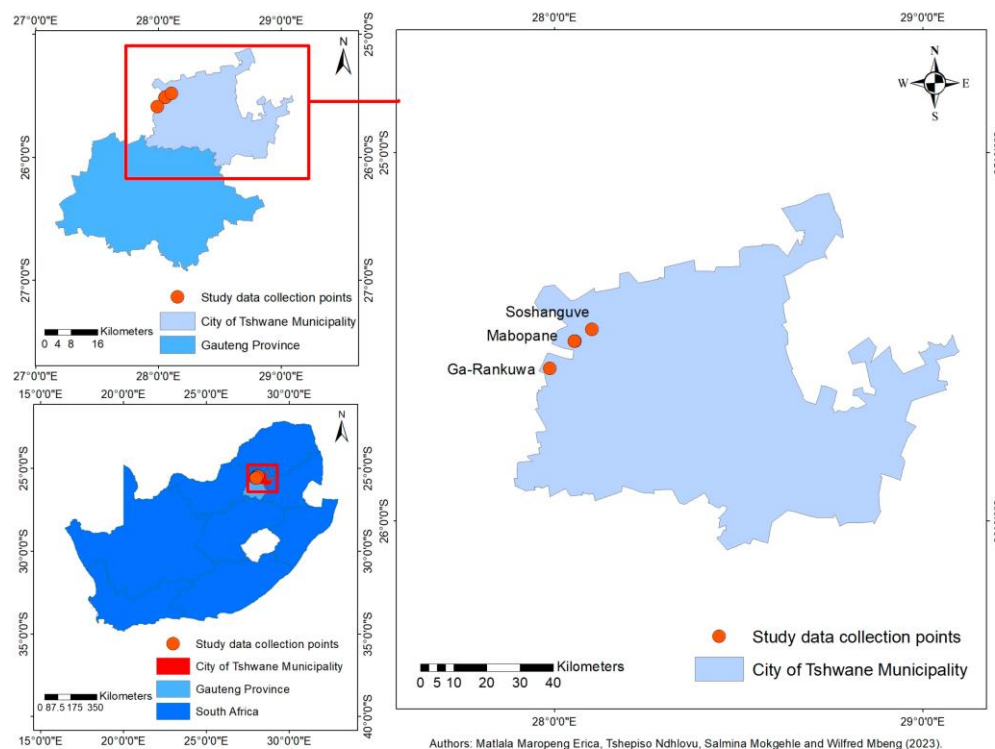


Figure 1. Geographical location of the study City of Tshwane Metropolitan Municipality, Gauteng Province, South Africa.

2.2. Study Species

This study investigated the ethnobotanical uses of *Mimusops zeyheri* (Figure 2), also called the Transvaal Red Milkwood, locally known as *Mmupudu* (Northern Sotho), *Mububulu* (Venda), *Umpushane* (Zulu) and *Moepel* (Afrikaans), is “an evergreen tree with a rounded crown”, belonging to the Sapotaceae family [27]. This large and shady tree is indigenous to southern Africa, mainly in South Africa, Botswana, Mozambique, Swaziland and Zimbabwe, Namibia. According to Deutschländer, et al. [28] and Manning [29] *M. zeyheri* is prevalent in open, dry and bushveld woodlands. In South Africa, this plant is primarily found in Limpopo, Northwest, Gauteng, Mpumalanga and KwaZulu Natal, growing in forested areas, on rocky slopes and riverine areas [30]. *M. zeyheri* is a habitat and food source for numerous animal species, such as mammals, birds and insects. During spring or early summer, the tree produces small white flowers that are sweetly scented. Fruits of this tree are round or slightly elongated berries. Young berries are initially green and turn bright yellow-orange when ripe. These fruits are edible and consumed by people, monkeys and other animal species. This plant species is easily cultivated from seeds, usually in frost-free summer rainfall regions and is drought-resistant [31]. It can survive with small amounts of water and a few hours of exposure to sunlight.

2.3. Data Collection

Ethnobotanical data was collected between May and July 2023. This data was mainly collected through face-to-face interviews using semi-structured questionnaires [32] with the selected knowledgeable elders (key participants). Most of these interviews and discussions were held in Setswana, the language widely spoken in the study area. Before data collection, the researcher explained the purpose of the study to the participants and obtained their consent to record and use their information. Demographic information of the participants was captured, followed by information about the utilization of the plant, its distribution and contributions to the lives of local people. A total of 53 participants were interviewed, and each was visited twice to verify the information’s reliability. If what was said during the first visit regarding the utilization of *M. zeyheri* by any participant differed from what

was said during the second visit, the information was considered unreliable and had to be discarded. These follow-up visits also helped in getting additional information that was not mentioned during the first interviews. A photograph of *M. zeyheri* was presented to the participants to ensure that the researcher and the participant were talking about the same plant species.

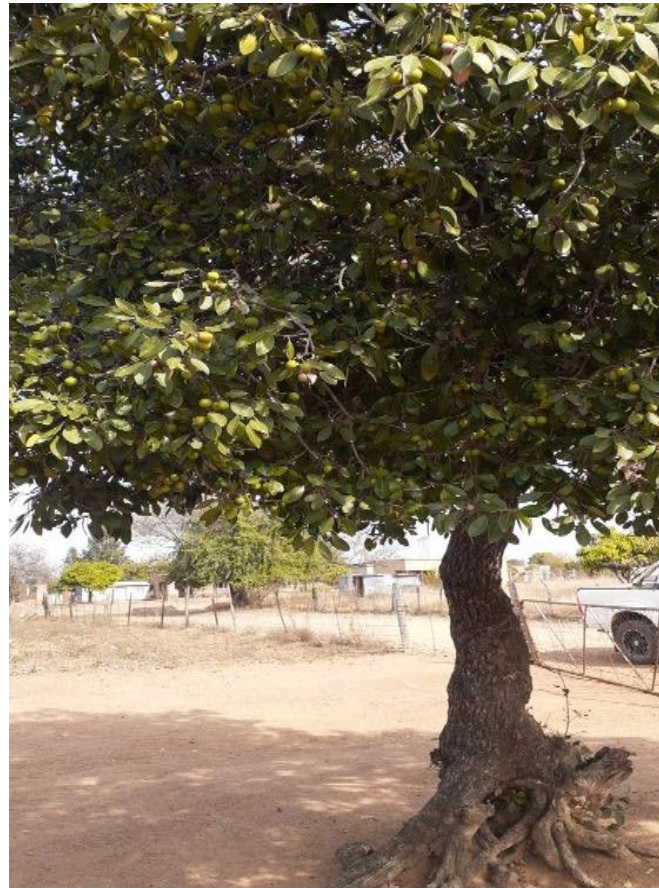


Figure 2. A picture of a *M. zeyheri* tree with unripe fruits (Pictures by Maropeng Erica Matlala).

2.4. Sampling Technique

As mentioned above, this study involved 53 participants who were purposefully selected. A total of 16 participants were from Soshanguve, 19 from Ga-Rankuwa and 18 from Mabopane. The study followed a purposive sampling method, a widely used tool for selecting participants in ethnobotany. Participants were chosen based on their knowledge and willingness to participate in the study. Only participants aged 18 years and above were included in the study because the study relied on the views of adults and knowledge experts. Individuals under 18 were excluded from the study because they are minors and, therefore, cannot consent. Participants were also chosen based on their ability to understand and communicate in English or Setswana.

2.5. Data Analysis

Primary data collected during interviews was then converted into statistical measures using ethnobotanical indices, including Use Value (UV) and Frequency of Citation (RFC). These ethnobotanical indices are tools used to quantify qualitative data [33], and they focus on the “value and importance of a species” [34].

Use Value:

Use Value marks the relative importance of the various uses of a plant species. It was calculated using a formula cited in the past, following the protocol of other scientists who have previously used the formula [35].

$$UV_i = \frac{\sum U_i}{N}$$

where “UV refers to the relative Use Value of the species, U is the number of uses mentioned by each participant, and N stands for the total number of participants who reported the species” [34].

Relative Frequency of Citation:

RFC was utilized to illustrate the relative relevance or the local importance of the species [36] in the study region considering the categories of its use. This was calculated using the formula previously utilized [37,38]. It was determined using the following equation:

$$RFC = \frac{FC}{N}$$

where RFC stands for Relative Frequency of Citation, FC represents the number of participants who cited the species and N refers to the total number of participants.

2.6. Ethics

Before conducting this study, ethical clearance was obtained from the University of Mpumalanga’s Research and Ethics Committee (UMP/Matlala/BScHons/12/06/2023). In this study, participants gave their informed consent to participate. They were made aware of all details of the study, its aims, objectives and the expectations from the researcher and participants. The consent form also provided that participation was voluntary and participants could withdraw from the study whenever they felt the need to do so. No one was pressured into participating in this study. This included any deception or persuasion intended to win someone’s trust.

Additionally, the study applied the anonymity principle, whereby participants’ identities remained confidential. All participants were treated with respect and dignity, and their opinions and views were respected. Participants were informed that there would be no immediate or direct benefit from the study. However, the study will benefit the community and, eventually, the world from the knowledge obtained from the participants.

3. Results**3.1. Demographic Information****3.1.1. Age of the Participants**

As indicated in Figure 3, participants were divided into four age groups and the majority (32%) of the participants who knew about *M. zeyheri* fell within the 51–65 age group, followed by those in the 66+ age group. Distinctively, the number of participants knowledgeable about *M. zeyheri* decreased among the younger participants. These results are similar to a previous study showing that elderly people are more informed about indigenous trees than young people [39]. This also implies that traditional knowledge about *M. zeyheri* in the City of Tshwane Metropolitan Municipality is facing the risk of being eroded with the passing on of older community members, as some participants have also mentioned. According to Machaba [40], the adoption and utilization of indigenous knowledge and indigenous plants are declining among younger generations, and this could be due to the younger generation’s less interest in inheriting and using traditional knowledge. Additionally, modernization and the advancements in technology and science have now changed the social setup and lifestyle patterns of people [41]. Therefore, young people are abandoning their traditions and cultures.

3.1.2. Gender Distribution of Participants

In terms of gender distribution, females (68%) were found to be more knowledgeable about *M. zeyheri* than males (32%) (Figure 4). According to Kainer and Duryea [42], women have extensive botanical knowledge and are skilled in collecting, processing and managing plants. This may be due to their participation in agricultural activities and cultural practices, their roles in traditional food systems and the management of resources [42]. This shows that women have more cultural awareness and knowledge about indigenous fruit trees. These results are consistent with that of a previous study showing that women have more knowledge about the use of medicinal plants than men [43], although, in some studies, men are found to be more knowledgeable than women [40,44,45].

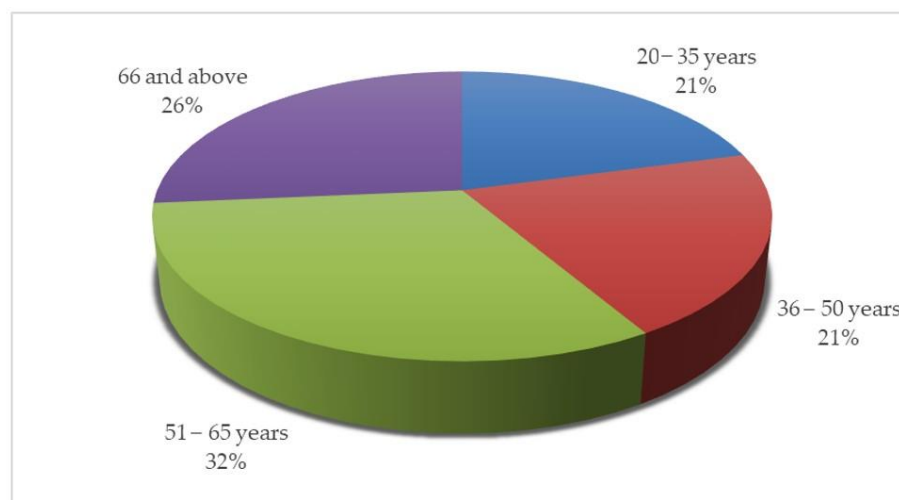


Figure 3. Age distribution of participants who were knowledgeable about *M. zeyheri* in the City of Tshwane Metropolitan Municipality, Gauteng Province, South Africa.

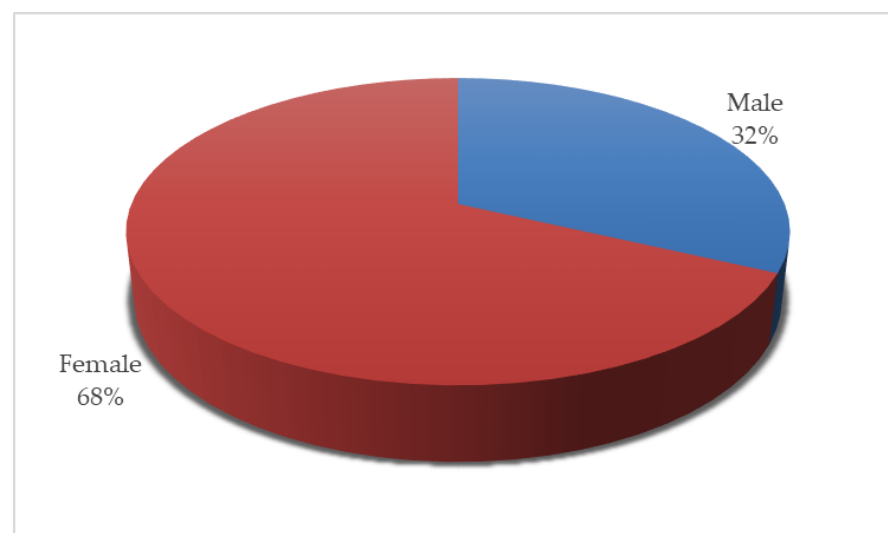


Figure 4. Gender distribution of participants who were knowledgeable about *M. zeyheri* in the City of Tshwane Metropolitan Municipality in Gauteng Province, South Africa.

In this study, most participants received a formal education—73.6% had secondary education, and 13.2% reached the tertiary level. Only 3.7% did not receive formal education. Education plays a major role in the participants' socioeconomic status and consciousness of environmental and health-related issues [46–48].

3.2. Ethnobotanical Uses of *M. zeyheri*

3.2.1. Nutrition

Mashela and Mollel [49] assessed several indigenous plants as alternate crops in South Africa. These indigenous fruit trees were ranked based on their edible qualities in fresh and beverage form, and *M. zeyheri* came out amongst the top plants for its edible fresh fruit qualities. *M. zeyheri* is mostly used as a food plant compared to other forms of use (Table 1). Its fruits have an “exceptionally high vitamin C content (90 mg/100 g)” [50], higher than that of several other indigenous and exotic fruits [51]. Thus, it could be used for economic and nutritional projects, crucial in poverty alleviation. Participants have indicated that the fruits of *M. zeyheri* can be consumed fresh from the tree or be dried and stored for later consumption [52,53]. These fruits can also produce jams, jellies, and alcoholic and non-alcoholic beverages [9,52,54].

3.2.2. Ethnomedicinal Uses

The utilization of plants as a source of medicine traces back to the beginning of the history of human well-being [55]. Even today, many African populations still depend on traditional medicine and traditional healers as the primary defence against most diseases [56]. The utilization of medicinal plants can be done through consultation with traditional healers or self-medication. According to Latif [57] and Elgorashi, et al. [58], most African people consult traditional healers in preference to or in addition to Western medical doctors. People use *M. zeyheri* extracts for different purposes in traditional medicine (Table 1). Some participants have explained how these extracts are used to treat common medical conditions (Table 1), mostly problems older people can prescribe treatment for without consulting a healthcare provider. According to Mogale, et al. [59], some people use home remedies because of the lack of access to professional healthcare providers or financial difficulties. Participants mentioned that *M. zeyheri* was commonly used as a treatment for diabetes mellitus [60,61], ulcers [62,63], gastrointestinal-related issues [52,54], inflamed gums and toothaches [62], headaches, sexually transmitted infections (STIs) [64], erectile dysfunction, menstrual cramps, smelly discharge (gynaecological infections) [59] and childhood diseases such as *hlogwana* (signs of meningitis or redness (haemangiomas) at the nape of the neck) and *khehlane*, also referred to as “sunken chest”.

3.2.3. Miscellaneous Uses

M. zeyheri has other uses besides food or medicine (Table 1). Some participants have mentioned that the leaves are used for ethnoveterinary purposes to improve the sexual performance of livestock such as (goats) during the breeding season. The stem/trunk of the tree can be used for carpentry or to make furniture [65]. Some participants have mentioned that the tree can be used as firewood, an important feature of local plant use [59]. Although there is electricity, some people still use fire to cook and boil water for bathing. Some participants have also mentioned that *M. zeyheri* can be used to do cleansings. A cleansing is a symbolic act that is meant to purify family members from defilement by death and to help them cope with grief and loss [66]. Some days after the burial, usually seven days, the immediate family and close relatives must be cleansed from bad luck, impurity and “darkness”. The grieving family is washed, but the widow must mourn for at least a year before she can be cleansed.

Table 1. Ethnobotanical uses of *M. zeyheri* as mentioned by participants in the City of Tshwane Municipality, Gauteng Province, South Africa (N = 53).

Plant Name	Ethnobotanical Use	References	Plant Part Used	Method of Preparation	Administration	N	RFC
<i>M. zeyheri</i>	Edible fruit	[50,51,62]	Fruit	The fruit is consumed fresh from the tree or can be dried or turned into a pulp and then mixed with water or milk to make beverages.	Orally	51	0.962
	Shade	[62]	Whole tree	-	-	1	0.018
	Firewood	-	Stem/trunk	-	-	2	0.037
	Carpentry	[67]	Stem/trunk	-	-	1	0.018
	Cleansing and purification	-	Barks, roots	Infusion and decoction	Orally and bathing	8	0.150
	Treating <i>diabetes mellitus</i>	[67]	Leaves	Decoction	Orally	9	0.169
	Treating ulcers	[68]	Leaves, roots, barks	Decoction	Orally	8	0.150
	Treating gastrointestinal-related issues	[69]	Leaves, roots, barks and seeds	Infusion and decoction	Orally	6	0.113
	Treating gum inflammation, toothaches and tonsils	[60,62]	Roots and leaves	Root decoction and leaf infusion	For inflamed gums and toothaches, rinse the mouth with root decoction; gargle with leaf infusion for tonsils	5	0.094
	Treating headaches	-	Roots	Crush dried roots and burn them	Crushed roots can be snorted like snuff, and if burned, inhale the smoke	3	0.056
	Treating erectile dysfunction and drop/gonorrhea (STIs)	[70]	Leaves, seeds and roots	Leaf infusion Seeds are dried, crushed and mixed food Root decoction	Orally	4	0.075
	Treating menstrual cramps and smelly discharge (gynecological infections)	[71]	Leaves	Infusion	Orally	1	0.018
	Boosting immunity among humans	-	Roots	Infusion	Orally	1	0.018
	Ethnoveterinary, to improve the sexual performance of livestock (goats) during the breeding season	-	Leaves	Mix with leaves with animal feed	Orally	1	0.018
Treating <i>hlogwana</i>	-	Leaves	Leaves are burned to ashes	Rub the ashes on an incision at the back of the child's neck	1	0.018	
Treating <i>khetlane</i> (sunken chest) and <i>khubyana</i> (umbilical cord)	-	Leaves	Decoction	Orally	1	0.018	

N stands for the number of participants who mentioned the use. “-” stands for none. RFC = number of informants who mentioned the use = 51 and total number of informants participating in the survey = 53 > RFC = 51/53 = 0.962.

3.3. Plant Parts Used

Different parts of *M. zeyheri* serve different purposes. Among the different parts, fruits (47%) were the most utilized part of the plant, followed by the leaves (22%), roots (18%) and bark (8%). The seeds (2%), stem (2%) and whole plant parts (1%) were less commonly used (Figure 5). These results resonate to those found in other studies in other parts of the world [72,73], which reported the predominant use of fruits. Most fruits are eaten raw after ripening, and others are dried and preserved for later use or to make beverages. In addition to being used as a food plant, *M. zeyheri* is also used as a medicinal plant for treating some common ailments. In this regard, the leaves were the commonly used part of the plant to treat those ailments. According to Ahmed [74] and Ghasemi, et al. [75], the utilization of leaves in herbal medicine is better for the endurance of medicinal plants compared to the bark and roots, which pose a serious threat to local plants because the excessive utilization of reproductive parts or roots for medicinal purpose can lead to a decline in plant populations [76].

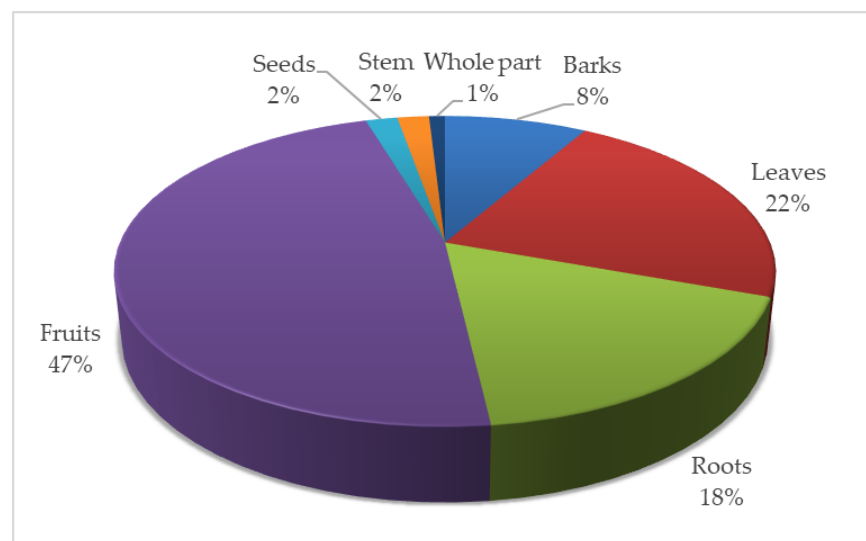


Figure 5. Distribution of *M. zeyheri* plant parts used by the participants in the City of Tshwane Metropolitan Municipality, Gauteng province, South Africa.

3.4. Methods of Preparation and Administration

Regarding the preparation method of *M. zeyheri*, decoctions (39%) and infusions (33%) were the most frequently reported methods that local people used (Figure 6). These results are comparable to what was found in other research [77,78], which revealed decoctions as the most frequently used preparation method. Due to their ease of preparation, decoctions are used as the main method of drug preparation in traditional healing systems [77]. Many indigenous cultures worldwide use them as their primary means of extracting the therapeutic properties of the plant [79–81]. Decoctions are prepared by boiling a certain part of the plant until the volume of the water is reduced by half [82]. This allows the thorough extraction of both water- and heat-soluble compounds, maximizing the therapeutic potential of the plant. Boiling the plant material in water also helps eliminate contaminants, making it safer than other preparation methods. Conversely, infusions involve soaking a plant part in hot water for some time, whether overnight or during the day [82].

Regarding the mode of administration, most of the herbal preparations are taken orally (Table 1). Other herbal preparations are used for gargling or as mouthwash, for bathing or sniffing. Some people also burn a certain part of the plant and inhale the smoke. Furthermore, some parts are crushed and burned, and the ashes are applied to an incision. Several studies have reported the various application methods [77,78].

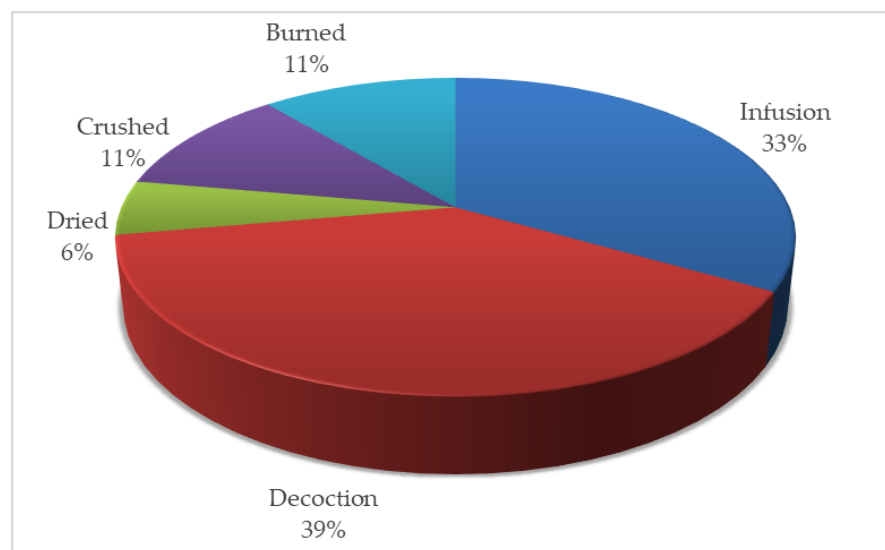


Figure 6. Ratio of *M. zeyheri* preparation methods employed by study participants in the City of Tshwane Municipality, Gauteng province.

3.5. Distribution of *M. zeyheri* in the City of Tshwane Municipality

M. zeyheri occurs in open, dry and bushveld woodlands [28,29]. In South Africa, it is primarily located in the northern provinces, including Gauteng, where it grows in the wild or forested areas, on rocky slopes and in riverine areas [30]. Gauteng province is the economic and industrial heartland of South Africa [83,84]. It is home to Johannesburg, the largest city in the country, which is the centre for commerce, finance, and mining activities. Due to the many economic opportunities it offers, its population continues to grow at an alarming rate, resulting in urban expansion [85]. Urban expansion requires the construction of houses, roads, industries and commercial spaces, often leading to land clearing and the destruction of natural habitats for more space. Natural habitats, such as forests, are converted into urban areas, industries and agricultural land. Furthermore, these dramatic land-use changes contribute to deforestation and, ultimately, the loss of significant indigenous trees [86,87].

Participants also confirmed that deforestation for growing urbanisation, has a negative impact on the population of wild plants, including *M. zeyheri*, in the study area leading to decrease in numbers. Furthermore, most participants have mentioned that it has been many years since they last saw *M. zeyheri*. This provides the possibility that significant plant species in the area may be threatened due to anthropogenic factors including deforestation. Several studies [88–91] have articulated that factors such as population growth, urbanisation, and the unorganised expansion of informal settlement is occurring at the cost of the natural environment. Likewise, the rise in industrial activities, mining activities and lack of compliance to regulation has heavily contributed to deforestation, inevitably leading to habitat destruction. This loss of natural habitats has a fatal impact on biodiversity and may lead to the loss of important species in the near future [91].

The loss of important indigenous fruit trees directly impacts sustainability in many ways, affecting the ecological balance, local livelihoods, and cultural heritage. Indigenous fruit trees have adapted to local climate conditions and, therefore, have a better chance of enhancing more sustainable agro-systems, combating land degradation and conserving the natural plant heritage [49,50]. For instance, *M. zeyheri* contributes significantly to biodiversity by providing several animal species with food and habitat [62]. It is also believed to improve soil fertility and prevent soil erosion with its fairly compact roots [62]. This is a good contribution toward environmental sustainability as this can reduce the costs of agricultural production. It is very crucial to recognize these values and implement proper conservation strategies to ensure a more sustainable future. Likewise, a holistic

approach is needed to ensure a continuous supply of nutrition and food security in the future, as it cannot be fulfilled from a single source [92].

3.6. Potential Socio-Economic Contribution of *M. zeyheri* to the Participants in the City of Tshwane Municipality

Indigenous fruit trees such as *M. zeyheri* possess an enormous potential to contribute to the well-being of locals by providing nutritional, medicinal and economic benefits [50,62]. However, despite their potential, these trees often fail to significantly impact local communities such as those in the City of Tshwane Municipality, as some participants have mentioned.

3.6.1. Food/Nutrition Security

Participants in the study area indicated that *M. zeyheri* does not contribute to food security. One of the primary reasons for this is the change in the dietary patterns and preferences of the local communities. Urbanization and globalization have influenced the cultural and dietary habits of local people, causing indigenous fruit trees to lose their appeal [93–95]. The introduction of exotic fruits and processed foods has led to the decreased consumption of indigenous fruits [96]. Therefore, this change in consumption patterns undermines the role of indigenous fruit trees such as *M. zeyheri* can play in food and nutritional security. Furthermore, participants have also pointed out that *M. zeyheri* does not contribute to food security because of its scarcity within their communities, which is caused by deforestation and urbanization. As a result, they must rely on other fruits that are readily available to them.

3.6.2. Medicinal Contributions

Indigenous trees have long been recognized as invaluable resources in local communities, providing various medicinal benefits [40,50,74]. Most have curative properties, forming an important part of healthcare systems worldwide, especially in rural communities. In this study, *M. zeyheri* is used to treat common health conditions. However, the majority of participants rarely use it, due to alienation from conventional medicine due to increase urbanization and modernization, which has greatly reduced reliance on traditional practices and beliefs [93,94]. Young people may be less inclined to use traditional medicine because they are exposed to globalized healthcare practices. Furthermore, some people may also choose modern medicine over traditional due to a better understanding of its mechanisms and its proven efficacy. Access to modern healthcare often comes at a cost. However, in some cases, government subsidies or health insurance make it more affordable than traditional remedies, often requiring buying specific herbs or consulting traditional health practitioners.

3.6.3. Economic Contributions

Local people can generate income, create employment and improve their livelihood by selling fruits and other products from indigenous trees [97,98]. However, market dynamics and economic pressures can limit the impact of indigenous fruit trees. For instance, due to a preference for exotic fruits for *M. zeyheri*, the lack of market or consumer demand can discourage communities from cultivating or harvesting these trees [93]. This, therefore, affects its potential contribution to local communities' economy. Another reason indigenous fruit trees may not contribute to the local economies is that the economic benefits from selling indigenous fruits might not be as strong as those from cash crops, pushing communities to prioritize other food crops or fruit [99]. Participants have also indicated that *M. zeyheri* does not provide them with any economic advantages due to the declining and scarce occurrence of these trees in their communities.

3.7. Importance of *M. zeyheri* in the City of Tshwane Municipality

3.7.1. Use Value (UV)

To evaluate the relative importance of *M. zeyheri* uses, UV was calculated. Use Value can vary based on the cultural, economic and ecological significance of a plant species to a community. The Use Value scores generally range from as low as 0 to a higher value, usually around 1 to 5, although it is possible to have higher values [100–102]. Higher Use Value suggest a relatively high level of usefulness and utilization [101,102]. It indicates that the plant is utilized for various purposes within a community, such as food, medicine and rituals.

Contrarily, if a plant has a low UV (near 0), it suggests it has few use reports. In this study, the UV of *M. zeyheri* was found to be 1.98 (Table 2). This suggests that the plant has moderate importance or utility in the community [103]. It indicates that the plant is used, but not extensively.

Table 2. Illustration of how Use Value (UV) was determined.

Number of uses mentioned by a participant	1	2	3	4	5
Number of participants who mentioned this number of uses	21	18	10	2	2
Total number of participants	53				

$$UV = (1 \times 21)/53 + (2 \times 18)/53 + (3 \times 10)/53 + (4 \times 2)/53 + (5 \times 2)/53 = 1.98.$$

3.7.2. Relative Frequency of Citation (RFC)

Relative Frequency of Citation also provides information about the importance and status of the plant species in the studied region. It describes the importance of a plant species with reference to participants who cited the plant species [55]. According to [104,105], a high RFC value indicates traditional knowledge is retained and transmitted smoothly among local people. Additionally, a high RFC may imply the plant species is easily available in the community, suggesting its constant and extensive use [82,106]. In this study, an overall RFC of 1.932 was calculated (Table 1). A Use Value of 1.98 suggests that *M. zeyheri* holds significant cultural and traditional importance in the study area.

3.8. Limitations of the Study

This study focused on a specific geographic region: the City of Tshwane municipality in Gauteng Province. This is a limitation because the study's findings cannot be taken as a general representation of the ethnobotanical information regarding *M. zeyheri* in the whole Province and South Africa. This study area is also a limitation because the province modernizes quickly, and people try to move with the times. Therefore, it was quite difficult to find people with indigenous knowledge. Some community members have never seen indigenous fruit trees in their areas. It would have been better to conduct the research in less urbanized areas (i.e., rural areas). Additionally, this study only concentrated on the views of participants knowledgeable about *M. zeyheri* in the City of Tshwane municipality. It would have been better to have a larger sample size, however, the researcher could only identify 53 participants due to time constraints. Some of the people who knew the studied species wanted to be paid for the time they were going to be interviewed and for the information they would share. This was an obstacle because the researcher could not access the valuable information that these people could have provided.

4. Conclusions and Recommendations

This ethnobotanical study evaluates the indigenous knowledge of the utilization of *M. zeyheri* and how it contributes to local communities in the City of Tshwane Metropolitan Municipality in Gauteng province, South Africa. Findings revealed that there are people in the area who still retain substantial indigenous knowledge. However, elders seemed to be

the real caretakers of this knowledge compared to the younger generation. Therefore, this knowledge is at risk of being lost with the passing on of knowledge holders, the younger generation's lack of interest, the impact of modernization and poor indigenous knowledge-sharing systems. Furthermore, results show that *M. zeyheri* might be threatened in the City of Tshwane as a result of the dramatic land use changes. This also affects its utilization and the indigenous knowledge associated with it. Therefore, this study documented the uses of *M. zeyheri* and also raised possible concerns about the conservation of this tree species and its associated knowledge in the study area.

This study highlights the importance of recognizing, learning and documenting indigenous knowledge. Therefore, governments should encourage young people to learn traditional indigenous knowledge by integrating it into school curriculums. The processing of *M. zeyheri* has a huge untapped potential for food security, income generation through creating self-employment and business development. Therefore, it is necessary to carry out more research on *M. zeyheri* for its possible cultivation on a large scale to ensure that it contributes to food and income security. Furthermore, the government needs to conduct awareness campaigns whereby knowledge holders, including local residents, are empowered with knowledge regarding *M. zeyheri* to change the negative perceptions that the community has regarding the use of these indigenous plant species.

Author Contributions: Conceptualization, M.E.M. and W.O.-M.; methodology, P.T.N.; software, M.E.M.; validation, W.O.-M., and P.T.N.; formal analysis, M.E.M. and P.T.N.; investigation, M.E.M.; resources, S.N.M.; writing—original draft preparation, M.E.M.; writing—review and editing, P.T.N. and S.N.M.; supervision, W.O.-M., P.T.N. and S.N.M.; project administration, S.N.M.; funding acquisition, W.O.-M. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by Water Research Commission, grant number 2023/2024-01331 and the APC was funded by University of Mpumalanga.

Institutional Review Board Statement: The research was revised by the Institutional Review Board with ethic approval number UMP/Matlala/BScHons/12/06/2023.

Informed Consent Statement: Informed consent was obtained from all participants involved in the study.

Data Availability Statement: Data are available on request from the corresponding author of the manuscript.

Acknowledgments: We are grateful to our participants for their willingness to be part of this study. We extend our sincere gratitude to L. B. Sibudugu for creating the map.

Conflicts of Interest: The authors declare no conflicts of interest. The funders had no role in the design of the study; in the collection, analyses or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

References

1. Cheikhoussef, A.; Embashu, W. Ethnobotanical knowledge on indigenous fruits in Ohangwena and Oshikoto regions in Northern Namibia. *J. Ethnobiol. Ethnomed.* **2013**, *9*, 34. [[CrossRef](#)]
2. Gunara, S.; Sutanto, T.S.; Cipta, F. Local Knowledge System of Kampung Naga: A Study to Investigate the Educational Values of Indigenous People in Transmitting Religious and Cultural Values. *Int. J. Instr.* **2019**, *12*, 219–236. [[CrossRef](#)]
3. Dweba, T.; Mearns, M.A. Conserving indigenous knowledge as the key to the current and future use of traditional vegetables. *Int. J. Inf. Manag.* **2011**, *31*, 564–571. [[CrossRef](#)]
4. Liu, C.; Gu, M. Protecting traditional knowledge of Chinese medicine: Concepts and proposals. *Front. Med.* **2011**, *5*, 212–218. [[CrossRef](#)] [[PubMed](#)]
5. Milburn, M.P. Indigenous nutrition: Using traditional food knowledge to solve contemporary health problems. *Am. Indian Q.* **2004**, *28*, 411–434. [[CrossRef](#)]
6. Kuhnlein, H.V.; Chotiboriboon, S. Why and how to strengthen indigenous peoples' food systems with examples from two unique indigenous communities. *Front. Sustain. Food Syst.* **2022**, *6*, 808670. [[CrossRef](#)]
7. Olowo, S.F.; Omotayo, A.O.; Lawal, I.O.; Ndhlovu, P.T.; Aremu, A.O. Ethnobotanical use-pattern for indigenous fruits and vegetables among selected communities in Ondo State, Nigeria. *S. Afr. J. Bot.* **2022**, *145*, 501–511. [[CrossRef](#)]

8. Ghosh-Jerath, S.; Singh, A.; Magsumbol, M.S.; Lyngdoh, T.; Kamboj, P.; Goldberg, G. Contribution of indigenous foods towards nutrient intakes and nutritional status of women in the Santhal tribal community of Jharkhand, India. *Public Health Nutr.* **2016**, *19*, 2256–2267. [[CrossRef](#)] [[PubMed](#)]
9. Omotayo, A.O.; Aremu, A.O. Underutilized African indigenous fruit trees and food–nutrition security: Opportunities, challenges, and prospects. *Food Energy Secur.* **2020**, *9*, e220. [[CrossRef](#)]
10. Wells, J.J.; Stringer, L.C.; Woodhead, A.J.; Wandrag, E.M. Towards a holistic understanding of non-native tree impacts on ecosystem services: A review of *Acacia*, *Eucalyptus* and *Pinus* in Africa. *Ecosyst. Serv.* **2023**, *60*, 101511. [[CrossRef](#)]
11. Mbhenyane, X.G.; Venter, C.S.; Vorster, H.H.; Steyn, H.S. Nutrient intake and consumption of indigenous foods among college students in Limpopo Province. *S. Afr. J. Clin. Nutr.* **2005**, *18*, 32–38. [[CrossRef](#)]
12. Godfray, H.C.J.; Beddington, J.R.; Crute, I.R.; Haddad, L.; Lawrence, D.; Muir, J.F.; Pretty, J.; Robinson, S.; Thomas, S.M.; Toulmin, C. Food security: The challenge of feeding 9 billion people. *Science* **2010**, *327*, 812–818. [[CrossRef](#)] [[PubMed](#)]
13. Gordon, L.J.; Bignet, V.; Crona, B.; Henriksson, P.J.; Van Holt, T.; Jonell, M.; Lindahl, T.; Troell, M.; Barthel, S.; Deutsch, L. Rewiring food systems to enhance human health and biosphere stewardship. *Environ. Res. Lett.* **2017**, *12*, 100201. [[CrossRef](#)]
14. Li, X.; Siddique, K.H. Future Smart Food: Harnessing the potential of neglected and underutilized species for Zero Hunger. *Matern. Child Nutr.* **2020**, *16*, e13008. [[CrossRef](#)] [[PubMed](#)]
15. Baa-Poku, F. Review on the role of underutilized crops in achieving food security in Ghana: Implications for policy. *Ghana J. Agric. Sci.* **2018**, *52*, 113–120.
16. Mayes, S.; Massawe, F.; Alderson, P.; Roberts, J.; Azam-Ali, S.; Hermann, M. The potential for underutilized crops to improve security of food production. *J. Exp. Bot.* **2012**, *63*, 1075–1079. [[CrossRef](#)] [[PubMed](#)]
17. Hunter, D.; Borelli, T.; Beltrame, D.M.; Oliveira, C.N.; Coradin, L.; Wasike, V.W.; Wasilwa, L.; Mwai, J.; Manjella, A.; Samarasinghe, G.W. The potential of neglected and underutilized species for improving diets and nutrition. *Planta* **2019**, *250*, 709–729. [[CrossRef](#)]
18. Li, X.; Yadav, R.; Siddique, K.H. Neglected and underutilized crop species: The key to improving dietary diversity and fighting hunger and malnutrition in Asia and the Pacific. *Front. Nutr.* **2020**, *7*, 593711. [[CrossRef](#)]
19. Hughes, J.d.A.; Ebert, A.W. Research and development of underutilized plant species: The role of vegetables in assuring food and nutritional security. *Acta Hort.* **2013**, *979*, 79–91. [[CrossRef](#)]
20. Muthayya, S.; Rah, J.H.; Sugimoto, J.D.; Roos, F.F.; Kraemer, K.; Black, R.E. The global hidden hunger indices and maps: An advocacy tool for action. *PLoS ONE* **2013**, *8*, e67860. [[CrossRef](#)]
21. Capone, R.; Bilali, H.E.; Debs, P.; Cardone, G.; Driouech, N. Food system sustainability and food security: Connecting the dots. *J. Food Secur.* **2014**, *2*, 13–22.
22. Mekonnen, A.B.; Mohammed, A.S.; Tefera, A.K. Ethnobotanical Study of Traditional Medicinal Plants Used to Treat Human and Animal Diseases in Sedie Muja District, South Gondar, Ethiopia. *Evid.-Based Complement. Altern. Med.* **2022**, *2022*, 7328613. [[CrossRef](#)] [[PubMed](#)]
23. Statistics South Africa. StatsSA. Available online: https://www.statssa.gov.za/?page_id=1021&id=city-of-tshwane-municipality (accessed on 15 September 2023).
24. Mangena, K.C. Investigating the Potential for Jacaranda Street Trees to Mitigate Climate Change in Tshwane, South Africa. Ph.D. Thesis, University of South Africa, Pretoria, South Africa, 2021.
25. Khwela, T.; Ayob, N.; Nkosi, N.; de Necker, L. The influence of environmental factors on the historical distribution of *Biomphalaria pfeifferi* in the Tshwane Metropolitan Municipality. *Proc. Int. Cartogr. Assoc.* **2023**, *5*, 8. [[CrossRef](#)]
26. Kruger, A.C.; Nxumalo, M.P. Historical rainfall trends in South Africa: 1921–2015. *Water SA* **2017**, *43*, 285–297. [[CrossRef](#)]
27. Hankey, A. *Mimusops zeyheri* (Sapotaceae). Available online: <http://pza.sanbi.org/mimusops-zeyheri> (accessed on 3 June 2023).
28. Deutschländer, M.S.; Lall, N.; van de Venter, M. Plant species used in the treatment of diabetes by South African traditional healers: An inventory. *Pharm. Biol.* **2009**, *47*, 348–365. [[CrossRef](#)]
29. Manning, J. *Southern African Wild Flowers—Jewels of the Veld*; Penguin Random House South Africa: New York, NY, USA, 2013.
30. Louw, M. Red Milkwood Fruit High in Vitamin C South African Medicinal Plants. Available online: <https://southafrica.co.za/red-milkwood-fruit.html> (accessed on 3 June 2023).
31. Wentzel, J. *Mimusops zeyheri*. Available online: <https://wildflowernursery.co.za/indigenous-plant-database/mimusops-zeyherii/> (accessed on 3 June 2023).
32. Cotton, C.M. *Ethnobotany: Principles and Applications*; John Wiley & Sons: Hoboken, NJ, USA, 1996.
33. Hoffman, B.; Gallaher, T. Importance indices in ethnobotany. *Ethnobot. Res. Appl.* **2007**, *5*, 201–218. [[CrossRef](#)]
34. Leonti, M. The relevance of quantitative ethnobotanical indices for ethnopharmacology and ethnobotany. *J. Ethnopharmacol.* **2022**, *288*, 115008. [[CrossRef](#)] [[PubMed](#)]
35. Amjad, M.S.; Arshad, M. Ethnobotanical inventory and medicinal uses of some important woody plant species of Kotli, Azad Kashmir, Pakistan. *Asian Pac. J. Trop. Biomed.* **2014**, *4*, 952–958. [[CrossRef](#)]
36. Signorini, M.A.; Piredda, M.; Bruschi, P. Plants and traditional knowledge: An ethnobotanical investigation on Monte Ortobene (Nuoro, Sardinia). *J. Ethnobiol. Ethnomed.* **2009**, *5*, 6. [[CrossRef](#)]
37. Dossou-Yovo, H.O.; Vodouhè, F.G.; Kaplan, A.; Sinsin, B. Application of Ethnobotanical Indices in the Utilization of Five Medicinal Herbaceous Plant Species in Benin, West Africa. *Diversity* **2022**, *14*, 612. [[CrossRef](#)]

38. Bano, A.; Ahmad, M.; Hadda, T.B.; Saboor, A.; Sultana, S.; Zafar, M.; Khan, M.P.Z.; Arshad, M.; Ashraf, M.A. Quantitative ethnomedical study of plants used in the skardu valley at high altitude of Karakoram-Himalayan range, Pakistan. *J. Ethnobiol. Ethnomed.* **2014**, *10*, 1–18. [[CrossRef](#)] [[PubMed](#)]
39. Hailemariam, M.B.; Woldu, Z.; Asfaw, Z.; Lulekal, E. Ethnobotany of an indigenous tree *Piliostigma thonningii* (Schumach.) Milne-Redh. (Fabaceae) in the arid and semi-arid areas of South Omo Zone, Southern Ethiopia. *J. Ethnobiol. Ethnomed.* **2021**, *17*, 44. [[CrossRef](#)] [[PubMed](#)]
40. Machaba, T.C. Ethnobotanical Survey of Medicinal Plants with Antifungal Activities in Makhado Local Municipality, Limpopo Province, South Africa. Ph.D Thesis, University of Limpopo, Mankweng, South Africa, 2018.
41. Shaheen, S.; Harun, N.; Ijaz, R.; Mukhtar, N.; Ashfaq, M.; Bibi, F.; Ali, M.; Abbas, Z.; Khalid, Z. Sustainability Issues in Conservation of Traditional Medicinal Herbs and Their Associated Knowledge: A Case Study of District Lahore, Punjab, Pakistan. *Sustainability* **2023**, *15*, 7343. [[CrossRef](#)]
42. Kainer, K.A.; Duryea, M.L. Tapping women's knowledge: Plant resource use in extractive reserves, Acre, Brazil. *Econ. Bot.* **1992**, *408–425*. [[CrossRef](#)]
43. Upadhyay, B.; Roy, S.; Kumar, A. Traditional uses of medicinal plants among the rural communities of Churu district in the Thar Desert, India. *J. Ethnopharmacol.* **2007**, *113*, 387–399.
44. Giday, M.; Asfaw, Z.; Woldu, Z. Ethnomedicinal study of plants used by Sheko ethnic group of Ethiopia. *J. Ethnopharmacol.* **2010**, *132*, 75–85. [[CrossRef](#)] [[PubMed](#)]
45. Belayneh, A.; Bussa, N.F. Ethnomedicinal plants used to treat human ailments in the prehistoric place of Harla and Dengego valleys, eastern Ethiopia. *J. Ethnobiol. Ethnomed.* **2014**, *10*, 18. [[CrossRef](#)]
46. Imran, M.; Akhtar, S.; Chen, Y.; Ahmad, S. Environmental Education and Women: Voices from Pakistan. *SAGE Open* **2021**, *11*, 21582440211009469. [[CrossRef](#)]
47. Omotayo, A.O. Economics of farming household's food intake and health-capital in Nigeria: A two-stage probit regression approach. *J. Dev. Areas* **2017**, *51*, 109–125. [[CrossRef](#)]
48. Omotayo, A.O. Farming households' environment, nutrition and health interplay in Southwest, Nigeria. *Int. J. Sci. Res. Agric. Sci.* **2016**, *3*, 84–98. [[CrossRef](#)]
49. Mashela, P.; Mollel, N. Farmer-identified indigenous fruit tree with suitable attributes for the semi-arid Northern Province of South Africa. *S. Afr. J. Agric. Ext.* **2001**, *30*, 1–12.
50. Monyela, S. Characterisation of Mmupudu (*Mimusops zeyheri*) Leaf Rust in Limpopo Province. Ph.D. Thesis, University of Limpopo, Mankweng, South Africa, 2021.
51. Venter, F.; Venter, J.-A. *Making the Most of Indigenous Trees*; Briza Publications: Pretoria, South Africa, 1996.
52. Constant, N.L.; Tshisikhawe, M.P. Hierarchies of knowledge: Ethnobotanical knowledge, practices and beliefs of the Vhavenda in South Africa for biodiversity conservation. *J. Ethnobiol. Ethnomed.* **2018**, *14*, 56. [[CrossRef](#)] [[PubMed](#)]
53. Chivandi, E. In Vitro and In Vivo Chemical Characterization of *Kigelia africana*, *Mimusops zeyheri*, *Terminalia sericea* and *Ximenia caffra* Nuts and Nut Meals. Ph.D. Thesis, University of the Witwatersrand, Johannesburg, South Africa, 2013.
54. Mabogo, D.E.N. The Ethnobotany of the Vhavenda. Ph.D. Thesis, University of Pretoria, Pretoria, South Africa, 1990.
55. Shinwari, S.; Ahmad, M.; Luo, Y.; Zaman, W. Quantitative analyses of medicinal plants consumption among the inhabitants of Shangla-Kohistan areas in Northern-Pakistan. *Pak. J. Bot.* **2017**, *49*, 725–734.
56. Sophy, M.M.; Mavis, M.F. The perceptions of traditional healers of cervical cancer care at Ga Mothapo Village in Limpopo Province. *Indilinga Afr. J. Indig. Knowl. Syst.* **2008**, *7*, 103–116.
57. Latif, S.S. Integration of African Traditional Health Practitioners and Medicine into the Health Care Management System in the Province of Limpopo. Ph.D. Thesis, University of Stellenbosch, Stellenbosch, South Africa, 2010.
58. Elgorashi, E.E.; Taylor, J.L.; Maes, A.; van Staden, J.; De Kimppe, N.; Verschaeve, L. Screening of medicinal plants used in South African traditional medicine for genotoxic effects. *Toxicol. Lett.* **2003**, *143*, 195–207. [[CrossRef](#)] [[PubMed](#)]
59. Mogale, M.M.P.; Raimondo, D.; VanWyk, B.-E. The ethnobotany of Central Sekhukhuneland, South Africa. *S. Afr. J. Bot.* **2019**, *122*, 90–119. [[CrossRef](#)]
60. Semanya, S.S.; Potgieter, M.J. Bapedi traditional healers in the Limpopo Province, South Africa: Their socio-cultural profile and traditional healing practice. *J. Ethnobiol. Ethnomed.* **2014**, *10*, 4. [[CrossRef](#)]
61. Semanya, S.; Potgieter, M.; Erasmus, L. Ethnobotanical survey of medicinal plants used by Bapedi healers to treat diabetes mellitus in the Limpopo Province, South Africa. *J. Ethnopharmacol.* **2012**, *141*, 440–445. [[CrossRef](#)]
62. Omotayo, A.O.; Ijatuyi, E.J.; Ogunniyi, A.I.; Aremu, A.O. Exploring the resource value of transvaal red milk wood (*Mimusops zeyheri*) for food security and sustainability: An appraisal of existing evidence. *Plants* **2020**, *9*, 1486. [[CrossRef](#)] [[PubMed](#)]
63. Amusan, O.O.; Dlamini, P.S.; Msonthi, J.D.; Makhubu, L.P. Some herbal remedies from Manzini region of Swaziland. *J. Ethnopharmacol.* **2002**, *79*, 109–112. [[CrossRef](#)] [[PubMed](#)]
64. De Wet, H.; Nzama, V.; Van Vuuren, S. Medicinal plants used for the treatment of sexually transmitted infections by lay people in northern Maputaland, KwaZulu–Natal Province, South Africa. *S. Afr. J. Bot.* **2012**, *78*, 12–20. [[CrossRef](#)]
65. Chivandi, E.; Mukonowenzou, N.; Nyakudya, T.; Erlwanger, K.H. Potential of indigenous fruit-bearing trees to curb malnutrition, improve household food security, income and community health in Sub-Saharan Africa: A review. *Food Res. Int.* **2015**, *76*, 980–985. [[CrossRef](#)]

66. Daber, B.N. The gendered construction of mourning and cleansing rites of widowhood amongst the Zulu speaking people of Ndwedwe community, KwaZulu-Natal. Ph.D. Thesis, University of Kwa-Zulu Natal, Durban, South Africa, 2003.
67. Abbet, C.; Mayor, R.; Roguet, D.; Spichiger, R.; Hamburger, M.; Potterat, O. Ethnobotanical survey on wild alpine food plants in Lower and Central Valais (Switzerland). *J. Ethnopharmacol.* **2014**, *151*, 624–634. [[CrossRef](#)] [[PubMed](#)]
68. Adhikari, P.P.; Talukdar, S.; Borah, A. Ethnomedicobotanical study of indigenous knowledge on medicinal plants used for the treatment of reproductive problems in Nalbari district, Assam, India. *J. Ethnopharmacol.* **2018**, *210*, 386–407. [[CrossRef](#)]
69. Adu-Gyamfi, Y. Indigenous beliefs and practices in ecosystem conservation: Response of the church: Church and environment. *Scriptura J. Biblic. Theol. Context. Hermeneut.* **2011**, *107*, 145–155.
70. Abdillahi, H.S.; Van Staden, J. South African plants and male reproductive healthcare: Conception and contraception. *J. Ethnopharmacol.* **2012**, *143*, 475–480. [[CrossRef](#)]
71. Abd-Elfarag, G.; Van Hensbroek, M.B. Nodding Syndrome: The unresolved mystery of a pediatric disease in Sub-Saharan Africa. *Pediatr. Infect. Dis. J.* **2019**, *6*, 67–71. [[CrossRef](#)]
72. Khakurel, D.; Upreti, Y.; Łuczaj, Ł.; Rajbhandary, S. Foods from the wild: Local knowledge, use pattern and distribution in Western Nepal. *PLoS ONE* **2021**, *16*, e0258905. [[CrossRef](#)]
73. Leal, M.L.; Alves, R.P.; Hanazaki, N. Knowledge, use, and disuse of unconventional food plants. *J. Ethnobiol. Ethnomed.* **2018**, *14*, 6. [[CrossRef](#)]
74. Ahmed, H.M. Ethnopharmacobotanical study on the medicinal plants used by herbalists in Sulaymaniyah Province, Kurdistan, Iraq. *J. Ethnobiol. Ethnomed.* **2016**, *12*, 8. [[CrossRef](#)]
75. Ghasemi, P.A.; Momeni, M.; Bahmani, M. Ethnobotanical study of medicinal plants used by Kurd tribe in Dehloran and Abadan districts, Ilam province, Iran. *Afr. J. Tradit. Complement. Altern. Med.* **2013**, *10*, 368–385. [[CrossRef](#)] [[PubMed](#)]
76. Giday, M.; Teklehaymanot, T. Ethnobotanical study of plants used in management of livestock health problems by Afar people of Ada'ar District, Afar Regional State, Ethiopia. *J. Ethnobiol. Ethnomed.* **2013**, *9*, 8. [[CrossRef](#)] [[PubMed](#)]
77. Umair, M.; Altaf, M.; Abbasi, A.M. An ethnobotanical survey of indigenous medicinal plants in Hafizabad district, Punjab-Pakistan. *PLoS ONE* **2017**, *12*, e0177912. [[CrossRef](#)] [[PubMed](#)]
78. Mahmood, A.; Mahmood, A.; Malik, R.N.; Shinwari, Z.K. Indigenous knowledge of medicinal plants from Gujranwala district, Pakistan. *J. Ethnopharmacol.* **2013**, *148*, 714–723. [[CrossRef](#)] [[PubMed](#)]
79. Lewis, W.H.; Elvin-Lewis, M.P. Medicinal plants as sources of new therapeutics. *Ann. Mo. Bot. Gard.* **1995**, *82*, 16–24. [[CrossRef](#)]
80. Gutiérrez, R.M.P.; Mitchell, S.; Solis, R.V. *Psidium guajava*: A review of its traditional uses, phytochemistry and pharmacology. *J. Ethnopharmacol.* **2008**, *117*, 1–27. [[CrossRef](#)] [[PubMed](#)]
81. Tugume, P.; Kakudidi, E.K.; Buyinza, M.; Namaalwa, J.; Kamatenesi, M.; Mucunguzi, P.; Kalema, J. Ethnobotanical survey of medicinal plant species used by communities around Mabira Central Forest Reserve, Uganda. *J. Ethnobiol. Ethnomed.* **2016**, *12*, 5. [[CrossRef](#)] [[PubMed](#)]
82. Sadeghi, Z.; Kuhestani, K.; Abdollahi, V.; Mahmood, A. Ethnopharmacological studies of indigenous medicinal plants of Saravan region, Baluchistan, Iran. *J. Ethnopharmacol.* **2014**, *153*, 111–118. [[CrossRef](#)]
83. Rogerson, C.M. Manufacturing change in Gauteng 1989–99: Re-examining the state of South Africa's economic heartland. In *Urban Forum*; Springer: Berlin/Heidelberg, Germany, 2000; pp. 311–340.
84. McKenzie, R.; Wegelin, W. Challenges facing the implementation of water demand management initiatives in Gauteng Province. *Water SA* **2009**, *35*, 168–174. [[CrossRef](#)]
85. Landau, L.B.; Gindrey, V. Migration and population trends in Gauteng province 1996–2055. *Migr. Stud. Work. Pap. Ser.* **2008**, *42*, 1–26.
86. Ntsanwisi, M.C. *An Assessment of Urban Expansion on a Wetland Ecosystem in Braamfischerville, Soweto, Gauteng Province, South Africa*; University of Johannesburg: Johannesburg, South Africa, 2019.
87. Nhamo, L.; Rwizi, L.; Mpandeli, S.; Botai, J.; Magidi, J.; Tazvinga, H.; Sobratee, N.; Liphadzi, S.; Naidoo, D.; Modi, A.T. Urban nexus and transformative pathways towards a resilient Gauteng City-Region, South Africa. *Cities* **2021**, *116*, 103266. [[CrossRef](#)]
88. Sarmin, N.; Hasmadi, I.M.; Pakhriyazad, H.; Khairil, W. The DPSIR framework for causes analysis of mangrove deforestation in Johor, Malaysia. *Environ. Nanotechnol. Monit. Manag.* **2016**, *6*, 214–218. [[CrossRef](#)]
89. Mehta, P.; Sekar, K.C.; Bhatt, D.; Tewari, A.; Bisht, K.; Upadhyay, S.; Negi, V.S.; Soragi, B. Conservation and prioritization of threatened plants in Indian Himalayan Region. *Biodivers. Conserv.* **2020**, *29*, 1723–1745. [[CrossRef](#)]
90. Cahyaningsih, A.P.; Avyda, K.D.; Pristiawati, C.M.; Ulumuddin, Y.I.; LKusumaningrum, L.; Setyawan, A.D. Causes and impacts of anthropogenic activities on mangrove deforestation and degradation in Indonesia. *Int. J. Bonorowo Wetl.* **2022**, *12*, 12–22. [[CrossRef](#)]
91. Pandya, M.; Didwania, K. Existential Repercussions of Development: Deforestation caused by Haphazard Urbanisation and Rapid Industrialisation. *Int. J.* **2021**, *1*, 1372–1397.
92. Antonelli, A. Indigenous knowledge is key to sustainable food systems. *Nature* **2023**, *613*, 239–242. [[CrossRef](#)] [[PubMed](#)]
93. Thyberg, K.L.; Tonjes, D.J. Drivers of food waste and their implications for sustainable policy development. *Resour. Conserv. Recycl.* **2016**, *106*, 110–123. [[CrossRef](#)]
94. Demi, S.M. African Indigenous Food Crops: Their Roles in Combatting Chronic Diseases in Ghana. Master's Thesis, University of Toronto, Toronto, ON, Canada, 2014.

95. Shai, K.N.; Ncama, K.; Ndhlovu, P.T.; Struwig, M.; Aremu, A.O. An exploratory study on the diverse uses and benefits of locally-sourced fruit species in three villages of Mpumalanga Province, South Africa. *Foods* **2020**, *9*, 1581. [[CrossRef](#)] [[PubMed](#)]
96. Qaim, M. Globalisation of agrifood systems and sustainable nutrition. *Proc. Nutr. Soc.* **2017**, *76*, 12–21. [[CrossRef](#)]
97. Akinnifesi, F.; Kwesiga, F.; Mhango, J.; Chilanga, T.; Mkonda, A.; Kadu, C.; Kadzere, I.; Mithofer, D.; Saka, J.; Sileshi, G. Towards the development of miombo fruit trees as commercial tree crops in southern Africa. *For. Trees Livelihoods* **2006**, *16*, 103–121. [[CrossRef](#)]
98. Asaah, E.K.; Tchoundjeu, Z.; Leakey, R.R.; Takouasting, B.; Njong, J.; Edang, I. Trees, agroforestry and multifunctional agriculture in Cameroon. In *Sustainable Intensification*; Routledge: London, UK, 2012; pp. 110–119.
99. Kumar, B.M.; Nair, P.R. The enigma of tropical homegardens. In *New Vistas in Agroforestry: A Compendium for 1st World Congress of Agroforestry*; Springer: Berlin/Heidelberg, Germany, 2004; pp. 135–152.
100. Šavikin, K.; Zdunić, G.; Menković, N.; Živković, J.; Čujić, N.; Tereščenko, M.; Bigović, D. Ethnobotanical study on traditional use of medicinal plants in South-Western Serbia, Zlatibor district. *J. Ethnopharmacol.* **2013**, *146*, 803–810. [[CrossRef](#)] [[PubMed](#)]
101. Panyaphu, K.; Van On, T.; Sirisa-Ard, P.; Srisa-Nga, P.; ChansaKaow, S.; Nathakarnkitkul, S. Medicinal plants of the Mien (Yao) in Northern Thailand and their potential value in the primary healthcare of postpartum women. *J. Ethnopharmacol.* **2011**, *135*, 226–237. [[CrossRef](#)] [[PubMed](#)]
102. Trotter, R.T.; Logan, M.H. Informant consensus: A new approach for identifying potentially effective medicinal plants. In *Plants and Indigenous Medicine and Diet*; Routledge: London, UK, 2019; pp. 91–112.
103. Zenderland, J.; Hart, R.; Bussmann, R.W.; Paniagua Zambrana, N.Y.; Sikharulidze, S.; Kikvidze, Z.; Kikodze, D.; Tchelidze, D.; Khutsishvili, M.; Batsatsashvili, K. The use of “Use Value”: Quantifying importance in ethnobotany. *Econ. Bot.* **2019**, *73*, 293–303. [[CrossRef](#)]
104. Bibi, F.; Abbas, Z.; Harun, N.; Perveen, B.; Bussmann, R.W. Indigenous knowledge and quantitative ethnobotany of the Tanawal area, Lesser Western Himalayas, Pakistan. *PLoS ONE* **2022**, *17*, e0263604. [[CrossRef](#)]
105. Tounekti, T.; Mahdhi, M.; Khemira, H. Ethnobotanical study of indigenous medicinal plants of Jazan region, Saudi Arabia. *Evid.-Based Complement. Altern. Med.* **2019**, *2019*, 3190670. [[CrossRef](#)]
106. Rehman, M.N.; Ahmad, M.; Sultana, S.; Zafar, M.; Edwards, S. Relative popularity level of medicinal plants in Talagang, Punjab Province, Pakistan. *Rev. Bras. Farmacogn.* **2017**, *27*, 751–775. [[CrossRef](#)]

Disclaimer/Publisher’s Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.