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Asparagus sekukuniensis (Oberm.) Fellingham & N.L.Mey.: A threatened medicinal plant species used by Vhavenda in the Soutpansberg Region, Vhembe Biosphere Reserve, Limpopo province, South Africa

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ABSTRACT

Asparagus sekukuniensis is at risk of extinction in South Africa due to over-collection as herbal medicine. However, there is a scant of literature on the diseases cured by the species, parts used, dosage, and how it is administered. Therefore, this study was aimed at documenting ethnomedicinal uses of *A. sekukuniensis*, in the Soutpansberg Region, Vhembe Biosphere Reserve, Limpopo province, South Africa. Data on ethnomedicinal uses of *A. sekukuniensis* were gathered with an aid of semi-structured dialogues, observations, and guided field walk by 125 participants between May and December 2018. Among the participants, laypeople were 35.2% and subsistence farmers were 14.4%. Specialist herbal healers include child health-care healers (29.6%), wound healers (11.2%), and general healers (9.6%). The recorded uses of *A. sekukuniensis* include the enhancement of fontanelle closure in an infant (24.8%), convulsions in an infant (22.4%), vaccinating epilepsy in an infant (17.6%), unhealed or cancer-related wounds (15.2%), genital wounds (12.0%), and boils (8.0%). *Asparagus sekukuniensis* appeared to be an important herbal medicine against infant ailments, wounds, infections, and infestations. These findings, therefore, call for an evaluation of the phytochemical and pharmacological properties of this species.

INTRODUCTION

Local people throughout the world have been using medicinal plants to maintain their well-being since time immemorial (Fabricant and Farnsworth, 2001; Falah and Hadiwibowo, 2017; Lulekal *et al*., 2013; Manzo *et al*., 2017; Saive *et al*., 2018; Yazdanshenas *et al*., 2016). Traditional medicines have also been the fundamental source of modern medicine, drug discovery, and synthesis (Qasim *et al*., 2014; Stanley *et al*., 2014). Traditional medicines are considered to be highly effective in the treatment of assorted illnesses (Rokaya *et al*., 2014). Up to date, more than 70% of people in the third world countries use traditional medicines as an alternative to primary health care (Chen *et al*., 2016; Kayani *et al*., 2014; Mahomoodally, 2013; Maroyi, 2011; Mazid *et al*., 2012; Scott *et al*., 2004; Sigidi *et al*., 2016). According to Mander *et al*. (2007), about 27 million native South Africans still rely upon traditional medicines for treating a range of health problems. Among the utilized species, there are taxa that are threatened with extinction due to overharvesting and habitat destruction (Harisha and Padmavathy, 2013; Kala and Sajwan, 2007). The habit of using threatened medicinal plant species by both village and city communities countrywide and across the globe continues despite the available legal implications set to restrict their collection (Kala, 2005; Ndhlala *et al*., 2011; Zschocke *et al*., 2000). Regardless of the availability and accessibility of modern medicines countrywide and worldwide (Seshathri, 2012), a large number of dwellers in the Soutpansberg Region continues to rely on and habitually

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preferred the use of herbal medicines without considering their conservation status. The high demand of plant resources due to their medicinal properties has been a major cause of threatened species decline (Van Andel *et al*., 2015; Williams *et al*., 2013; Yao *et al*., 2012), including the species belonging to genus *Asparagus L.* (Asparagaceae).

It is evident that many species within the genus, *Asparagus* are being used for medicinal or ornamentals (Goyal *et al*., 2003; Norup *et al*., 2015), and they are also listed as either Endangered, Vulnerable, or Near Threatened (Raimondo *et al*., 2009). The genus *Asparagus* L. is considered to have more than 200 species distributed within the arid and semi-arid zones worldwide (Fukuda *et al*., 2005; Kubota *et al*., 2012). About 120 species, including *Asparagus sekukuniensis* have been recorded in Southern Africa, Europe, and Asia (Batchelor and Scott, 2006; Fellingham and Meyer, 1995). *Asparagus sekukuniensis* is endemic to the Limpopo province, South Africa and categorized as Endangered as its habitat is widely transformed and degraded due to mining, new settlement development, over-grazing, crop cultivation, and over-collection as an herbal medicine (Burrows *et al*., 2012; Mukhopadhyay and Ray, 2013). However, there is a scant of literature on the diseases cured by the species, parts used, dosage, and how this species is administered in the traditional health care systems. Therefore, this study aimed at documenting ethnomedicinal uses of *A. sekukuniensis*, in the Soutpansberg Region, Vhembe Biosphere Reserve, Limpopo province, South Africa. As like in other aboriginal cultural communities worldwide (Bhat *et al*., 2013), a large amount of knowledge about the medicinal use of *A. sekukuniensis* in Soutpansberg's traditional health care systems is transmitted orally and this wealth of knowledge need to be documented to avoid its subsequent loss. This could not only preserve the Vhavenḓa's traditional health care systems and knowledge but also provide baseline data needed for advanced research on the species.

MATERIALS AND METHODS

Study site description

The current investigation was conducted in four sub-villages of a Vhulaudzi village in Soutpansberg East, Vhembe Biosphere Reserve, Limpopo province, South Africa (Fig. 1 and Table 1). Study sites were located within the north-eastern region of the Makhado Local Municipality, along the Witflag road to Tshikombani which diverge from N1 north route at approximately 3.5 km from Louis Trichard Makhodo (Fig. 1 and Table 1). The study sites covered the combined surface area of roughly 6.99 km^2, with the combined estimated population size of 8 276 people (Census, 2011). The study sites are predominantly occupied by the black ethnic group of Vhavenḓa tribe, who also speak Tshivenḓa as their native language. Vegetation type of study sites is considered to be savanna bushveld (Luseba and Tshisikhawe, 2013). Climatically, the study sites are described by a warm-wet summer (span from October to April) and cold-dry winter (May to September) (Edokpayi *et al*., 2016; Gumbo *et al*., 2016; Kephe *et al*., 2016), with an average annual rainfall range from 300 mm (winter season) to 820 mm (Summer season) (Mpandeli, 2014), and the average annual temperature range from 20ºC during the winter season and 30ºC in summer (Mzezewa and Rensburg, 2011). The topography and geological features of the study sites include Bushveld Igneas complexity, Karoo systems, Limpopo Belt Archaean Cratons, Kalahari Cratons, and the Wylies Poort geological formation of the Soutpansberg Group (Barton *et al*., 2006; Mostert *et al*., 2008).

Ethnobotanical data collection and analysis

Ethnobotanical data about the medicinal uses and administration of *A. sekukuniensis* in the treatment of various ailments were gathered from May to December 2018, with an aid of semi-structured dialogues with participants. A total number of 125 participants were arbitrarily chosen, and prior signed informed consent permitted by the University of Fort Hare Research Ethic Committee (Reference no. MAR031SRAM01) was obtained from all of them. Among the participants, 44 were laypeople (35.2%), 18 were subsistence farmers (14.4%), and the combined total of 63 specialists were herbal-healers (50.4%) (Fig. 2). Among specialist herbal healers, there was 37 child health-care healer (29.6%), 14 wound healers (11.2%), and 12 general healers (9.6%) (Fig. 2). To intensify the participation confident and smooth flow of ideas amongst the interviewees, face-to-face dialogues were carried-out together with all the participants, at the individual level, using their own local language (Tshivenḓa). To maintain the high-level standard of legitimacy, accuracy and validity of the given answers during the interview sessions, equivalent questions were administered to all the participants of this study. Gathered data were kept in a Microsoft Office spreadsheet program and later analyzed using

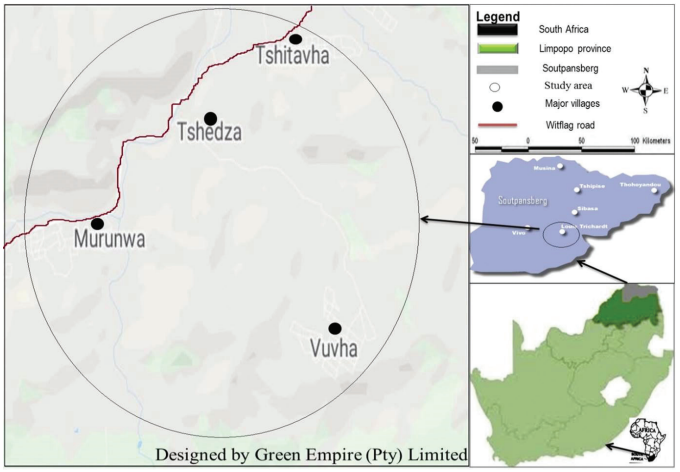

Figure 1. Locality map of the study areas

Table 1. Coordinates of the location of the study areas.

Vhulaudzi sub-villages	Latitudes	Longitudes
Muruṅwa village	−22°58′23.31″S; −22°58′55.94″S	30°9′19.89″E; 30°10′1.37″E
Tshedza village	−22°58′6.77″S; −22°58′28.53″S	30°10′31.56″E; 30°11′41.36″E
Tshiṱavha village	−22°57′51.76″S; −22°57′41.67″S	30°10′47.55″E; 30°12′26.35″E
Vuvha village	−22°59′13.26″S; −22°59′39.93″S	30°11′44.13″E; 30°12′34.04″E

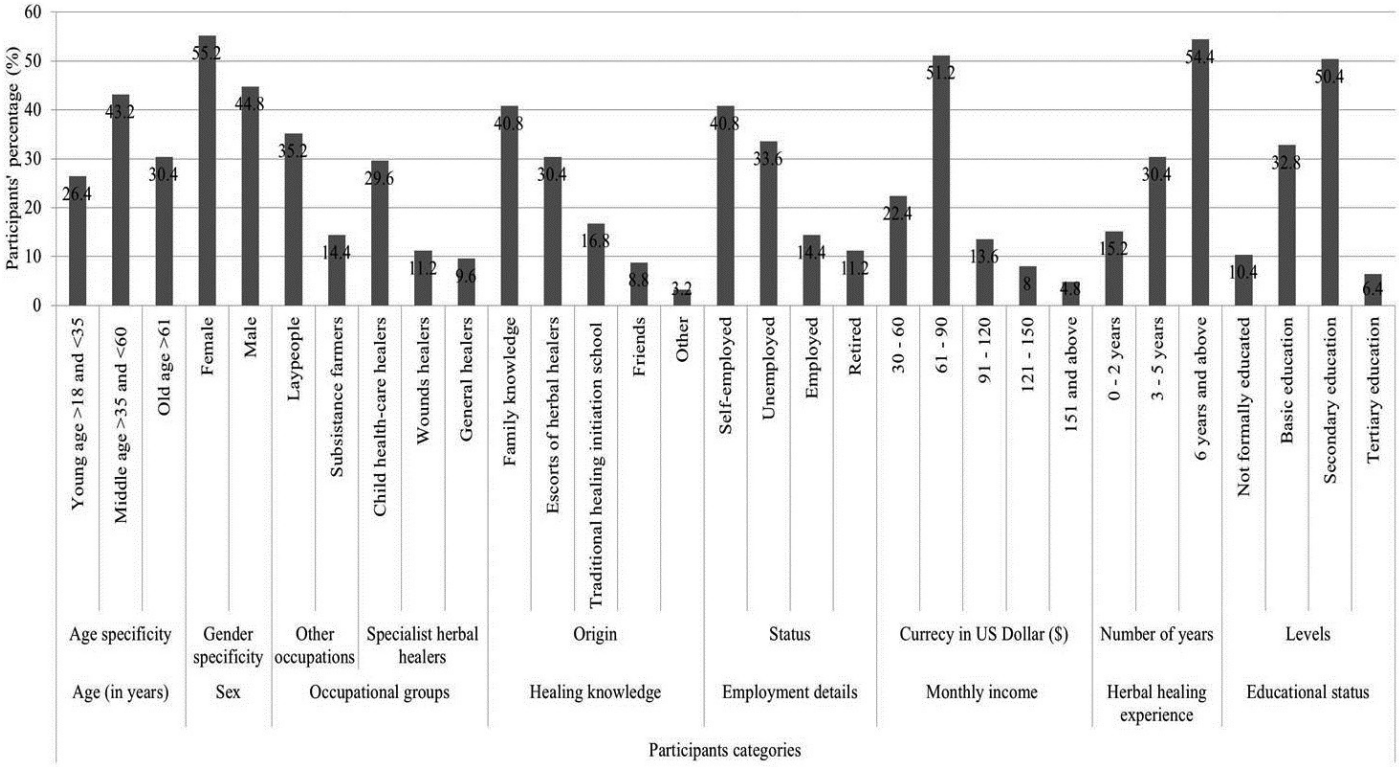

Figure 2. participant's biographical information.

Table 2. Ethnobotanical uses, preparations, and administration [Key: A—Mabogo (1990), F—frequency, and FL (%)—fidelity level percentage] (Note: *Asparagus Sekukuniensis* is locally known as Lufhaladza makole-lwa-thavha/ Muri-wa-muthuso)

Ailments	Used parts	Preparation modes	Administration modes	F (n = 125)	FL (%)	No. of same use citations
Enhancement of fontanelle closure in infants	Root	Burned black ashes are ground into fine powder and then mixed with saturated oil	Small cuts are made on the skin around the fontanelle part using a razor-blade and then medication is administered to the bleeding area	31	24.8	None
Convulsions in infants	Whole plant	The grounded powder is mixed with a fine powder made from barks of *Maerua angolensis* DC. subsp. *angolensis.*	Small cuts are made around or on different body parts of the newly born baby using a razor blade to allow blood to come out and then the medication is administered into the bleeding area to allow it to enter into the blood stream. Afterwards, the same mixture of powder is then poured into a heated clay pot without water while covering the patient with a blanket to contain the produced smoke	28	22.4	1 (A)
Vaccination of epilepsy in infants	Whole plant	Burnt to produce smoke and ashes.	The naked newly born baby carried by the herbal practitioner is moved around the produced smoke three times per day (morning, afternoon and evening) for the period of a week. The burned ashes are then mixed with the urine of the rock rabbit ("Ṭhulo") and then taken orally twice per day until the newly born baby is two years old. The mixture of ashes and urine of rock rabbit is called "Muuluso"	22	17.6	None
Unhealed or cancer-related wounds	Root	A decoction of fresh root, dried root is ground into a fine powder and mixed with a powder made from the barks of *Ozoroa reticulata* (Baker f.) R.Fern. & A. Fern	A decoction of fresh roots taken orally whereas, a mixture of powders is administered into the unhealed wounded body part	19	15.2	None
Genital wounds	Root.	The dried root is ground into a fine powder and then mixed with saturated oil	Administered to the wounding area	15	12.0	None
Boil in both humans and live stocks	Whole plant	Fresh materials are boiled to produce steam	Steam is applied around the area where boil occurs to soften it so that it gets healed	10	8.0	None

components of the descriptive statistic, such as frequency of occurrence and fidelity level (FL) (%). FLs (%) were determined using the following formula: FL (%) = $N_p/N \times 100$, where FL (%) is the FL percentage; N_p, the number of individuals who cited a certain use, and N is a total number of individuals who cited all the uses (Al-Qura'n, 2009; Umair *et al*., 2017). Since all participants have cited ethnomedicinal uses of *A. Sekukuniensis*, N was equal to 125.

Plant identification and specimen collection

Gathered data were supplemented by field inspection walks together with participants for plant identification purposes and specimen collection. The voucher specimen collection permit (ZA/LP/92932) was granted by the Limpopo Department of Economic Development, Environment and Tourism. During the field inspection walk, participants have identified the plant species of interest using its vernacular name and sample specimen was then collected, prepared (pressed and dried), and numbered (RAMLJ 013). A voucher specimen was then deposited at the Botany Herbarium, Life Science and Chemistry Building, the University of Venda for further identification by taxonomists.

RESULTS AND DISCUSSION

Ethnomedicinal uses

Table 2 reports on the recorded ethnomedicinal uses, preparation techniques, and administration procedures of *A. sekukuniensis* by the Vhavenḓa people in the Soutpansberg Region, Vhembe Biosphere Reserve, Limpopo province, South Africa. A total of six ethnomedicinal uses of *A. sekukuniensis* were recorded in this study. FL of the six recorded uses ranged from 8.0% to 24.8% (Table 2). More than 64.8% of all the participants in the current study seemed to be communally utilizing *A. sekukuniensis* for child health care-related ailments (Table 2). According to the participants, ensuring child's health was always an important cultural norm for Vhavenḓa people in the region and therefore, all newly born infants undergo traditional vaccination rituals to strengthen their immune systems called *muthuso* (personal communication with the participants). According to Rikhotso (2016), *muthuso* referred to the use of varied herbal medicines to protect the infants against miscellaneous ailments. The communal use of certain medicinal plant species by various herbal healers proves the effectiveness and therapeutic reliability of these implicated species (Semenya and Maroyi, 2018). Participants across the study sites have stated that they utilized *A. sekukuniensis* for curing the variety of ailments, including enhancement of fontanelle closure in infants (FL = 24.8%), convulsions in infants (FL = 22.4%), vaccinating epilepsy in infants (FL=17.6%), treating the unhealed or cancer-related wounds (FL = 15.2%), genital wounds (FL = 12.0%), as well as boils treatment in both human beings and livestock (FL = 8.0%) (Table 1). Thus, this study argued that the repetitive use of *A. sekukuniensis* in addressing miscellaneous ailments (Table 2) demonstrates the variety of biological activities it may possess. The aforementioned statement was supported by other scholars worldwide (Cheikhyoussef *et al*., 2011; Khan *et al*., 2014; Mojahedi *et al*., 2014). However, Jamila and Mostafa (2014) argued that the reliability of traditional herbal medicines, in the treatment and prevention of certain ailment, should not be doubted, but phytochemical validated for authenticity.

The utilized parts of *A. sekukuniensis* included roots (50%) and whole plant (50%) (Table 2). The equal utilization proportions of *A. sekukuniensis* parts were influenced by the fact that healers do not want to lose any materials of this species since this plant is scanty to be found (personal communication). This was endorsed by the study done by Burrows et al. (2016), whereby *A. sekukuniensis* was categorized as an Endangered species under the International Union for Conservation of Nature. Furthermore, this study argued that the equal utilization of *A. sekukuniensis* parts demonstrates the equal therapeutic efficacy (Ramarumo *et al*., 2019). Moreover, the results of this study do not conform to other ethnomedicinal studies in the region since leave was portrayed as the most frequently used plant part (Luseba and Tshisikhawe, 2013; Mahwasane *et al*., 2013; Masevhe *et al*., 2015; Mulaudzi *et al*., 2012).

CONCLUSION

The current study has enlightened five uses associated with *A. sekukuniensis* which were never reported elsewhere in the world (Table 2). *Asparagus sekukuniensis* appeared to be an important herbal medicine against infant ailments, wounds, infections, and infestations. These findings, therefore, call for the evaluation of the phytochemical and pharmacological properties of this species.

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CONFLICT OF INTERESTS

The authors declare that they have no conflicts of interest.

ETHICAL APPROVAL

The ethical authorization of this study was permitted by the University of Fort Hare's Research Ethic Committee (Reference no. MAR031SRAM01).

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