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Ethnobotanical study of plants used medicinally by Bapedi traditional healers to treat sinusitis and related symptoms in the Limpopo province, South Africa

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Summary

Traditional uses of plants treating sinusitis are under-studied in Africa and elsewhere. The present study therefore explored ethnobotanical practices of 132 Bapedi traditional healers (THs) pertinent to these diseases in the three districts of Limpopo Province, South Africa. Information was accrued using a semi-structured questionnaire in personal interviews, complemented by field observations. A total of 44 plant species belonging to 43 genera and 29 botanical families, mostly the Fabaceae (n=5 spp.) and Asteraceae (n=4 spp.) were documented as being used by THs for sinusitis and related symptoms. Trees (40.9%), followed by herbs (36.3%) and shrubs (22.7%) occupied the highest floristic composition. Roots (43.1%) and leaves (22.7%) were the most preferred parts from these habits for herbal preparation. The most popular species across the surveyed districts for treating sinusitis and related symptoms were *Adansonia digitata*, *Clerodendrum ternatum*, *Cryptocarya transvaalensis*, *Enicostema axillare*, *Kalanchoe brachyloba*, *Lasiosiphon caffer*, *Moringa oleifera*, *Sclerocarya birrea*, *Siphonochilus aethiopicus* and *Stylochaeton natalensis*, each scoring the highest fidelity level and use value indexes. Most species used by interviewed THs are recorded in this study for the first time as medicines for these ailments.

Key words: Bapedi traditional healers, respiratory tract infections, sinusitis, South Africa, traditional medicine

Introduction

According to RIGHTDIAGNOSIS (2016), sinusitis is a long-term ongoing or recurring inflammation of the air-filled spaces that are located within the bones in and around the nose. This inflammation leads to blockade of the normal sinus drainage pathways, which in turn results in mucus retention, hypoxia, decreased mucociliary clearance and predisposition to bacterial growth (RADOJICIC, 2012). Approximately 0.5% of all upper respiratory tract infections worldwide are complicated by this affliction (WORRALL, 2011). Therefore, sinusitis is an important global public health problem. In 2001, this condition represented 13.6 million outpatient visits in the United States of America (SPIEGEL, 2004). It is estimated that 134 million Indian populations are diagnosed with sinusitis annually (SUNALI and GHARPURE, 2012). Its prevalence in seven cities in mainland China ranged from 4.8% to 9.7% in 2015 (Shi et al., 2015). NAZRI et al. (2013) reported higher incidence of between 14.8% and 37% in Australia. In Pakistan over 25% of children suffer from sinusitis (SAMI et al., 2013), and from July 2000 to June 2001, 6.3 million new diagnoses of this ailment were identified in Germany (BACHERT et al., 2003).

Little evidence exists suggesting that sinusitis is also one of the most common and significant health care problems in some African countries. For instance, its episode of 11.7% in Nigeria was noted by ISEH and MAKUSIDI (2010). MAVALE-MANUEL (2007) who conducted an epidemiological study incorporating 27 schools in suburban and semi-rural areas around Maputo, found that the incidence of sinusitis was 23% and 8.8%, respectively. In South Africa, an earlier study by NRIAGU (1999) reported the prevalence of 16–27% of this ailment amongst the children residing in KwaZulu-Natal Province. Risk factors of sinusitis such as HIV/AIDS, exposure to pollution, poverty and poor health infrastructures (OLUSESI and TSHIPUKANE, 2011) are prevalent in South Africa, thus suggesting that this disorder might be common and also on the rise across the various geographical areas of the country.

Typical symptoms of sinusitis include cough, facial pain, fever, fatigue, halitosis, headache, irritability, nausea and rhinorrhoea (SLAVIN et al., 2005), and its complications encompasses blindness, brain abscess, meningitis, orbital abscess and osteomyelitis, amongst the others (REULER et al., 1995). To avoid these complications it is therefore obligatory that sinusitis be treated or managed as earliest as possible.

Treatment of sinusitis and related symptoms by traditional doctors of various cultures is mainly based on the prescriptions of herbal medicine. This fact is highlighted by general ethnobotanical studies conducted amongst diverse ethnic groups residing in countries such as India (RAMESHKUMAR and RAMAKRITINAN, 2013), Brazil (AGRA et al., 2008), Pakistan (KAYANI et al., 2015), Vietnam (MINH et al., 2014), Yemen (BHUWAN et al., 2015). Similar surveys carried amongst African traditional healers (THs) practicing in various countries including Ethiopia (ABERA, 2014), Cameroon (AGBOR and NAIDOO, 2014), Nigeria (AWOYEMI et al., 2012) and Lesotho (KOSE et al., 2015) emphasised this. In South Africa same studies was executed amongst cultures such as Zulu (COOPOOSAMY and NAIDOO, 2012) and Xhosa (MBENG, 2013), Tswati (MANZINI, 2005) and Rastafarian (NZUE, 2009), and found that THs/people do treat sinusitis with medicinal plant remedies. However, nothing is known about the medicinal plant remedies used by Bapedi THs residing in the Limpopo Province (South Africa). Overall, despite the glimpse of evidence suggesting that THs do treat sinusitis, there are still no ethnobotanical studies focusing on the documentation of indigenous knowledge pertinent to this condition in South Africa, Africa as a condition and elsewhere. This study was therefore initiated to bridge this gap in knowledge.

Materials and methods

Study area and population

The present study was conducted in the municipalities of Capricorn, Sekhukhune and Waterberg districts of the Limpopo, South Africa (Fig. 1). Five rural settlements from each of these municipalities were selected as a study site.

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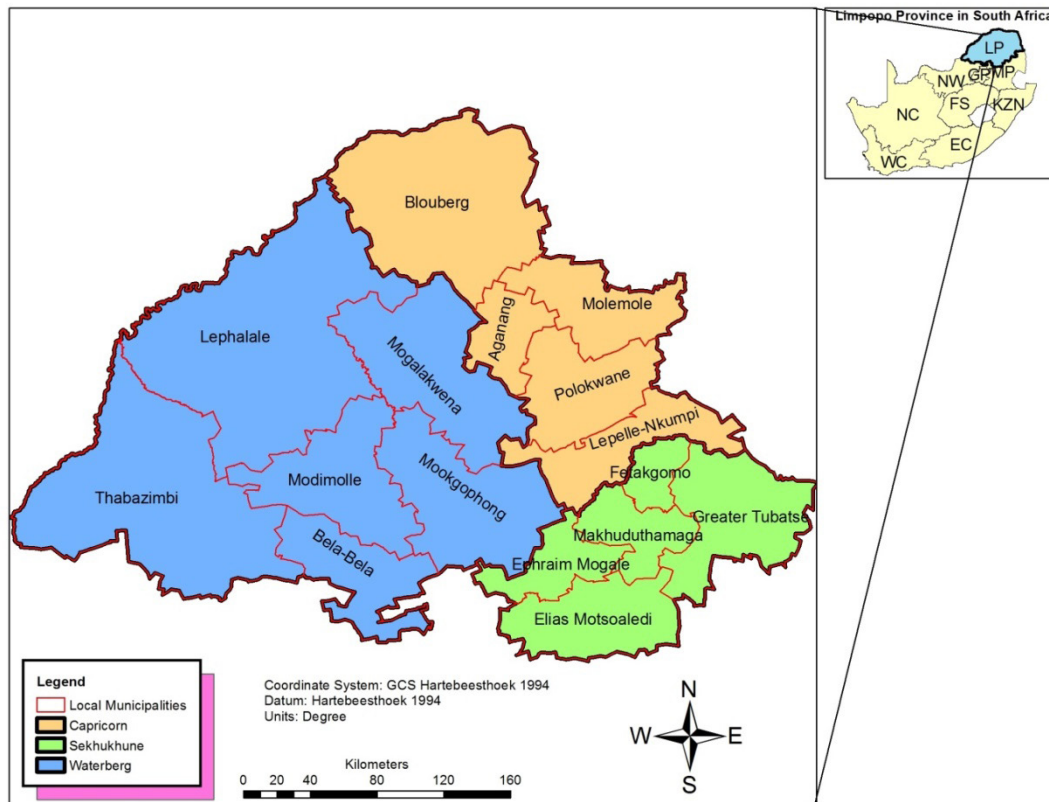


Fig. 1: Map of Limpopo Province indicating the studied areas (districts and municipalities).

The local inhabitants of the studied areas, the Bapedi, speak a dialect of Sepedi in the Sotho language group. This culture occupies a large part of Limpopo Province, with an estimated 52.9% of the population (SOUTHAFRICA.INFO, 2016). Overall, the studied areas are poorly developed by government and very few services are available to the people. The vast majority of the houses are made of locally sourced natural materials (i.e., timber, grass and mud). Most of the villages lack health centres, and as such, people have to pay for expensive and scarce transportation to access the adjacent centre. For most ailments, TH's services are the only accessible and affordable healing treatments.

Ethnobotanical survey and data collection

Before the survey commenced, permission to conduct the study was granted from the community leader of each sampled village, and THs who agreed to participate in our survey were requested to sign a consent form. The objective of the study was explained to both local tribal leaders and THs in their native language of Sepedi.

Ethnobotanical enquiry and data gathering was carried out from May 2017 to October 2017 through face-to-face interviews guided by a semi-structured questionnaire and direct observation, with 132 THs who were conveniently sampled (i.e., with the help of local community leaders and THs). This questionnaire was designed to provide information on the Pedi vernacular names of medicinal plants used for sinusitis and related symptoms, used plant part/s, methods of herbal preparation and administration, amongst other data. Generally, interviews were conducted individually with each healer.

Field trips for plant collection and observation were conducted in the company of each interviewed THs. Plant species were identified by healers via vernacular name/s, and subsequently researchers collected specimen for scientific identification. The plant specimens

were collected using standard taxonomical procedures (e.g. taking specimens with flowers and fruits whenever possible). Each plant sample was numbered and deposited at the Larry Leach Herbarium (University of Limpopo) for identification of botanical name by taxonomist. Voucher specimens of each species were stored in this herbarium for future references.

Data analysis

Micro Soft Excel and Statistical Package for the Social Sciences (SPSS)

Ethnobotanical data gathered from the interview session and field tours with THs were entered in to Microsoft Excel 2000 spreadsheet, and SPSS version 14.0, afterwards analysed using descriptive statistics such as frequencies and percentages.

Fidelity level (FL)

The uniformity and degree of therapeutic exploitation amongst THs with respect to an individual species against sinusitis and/or related symptoms was determined using FL as described by AL-QURAN (2009), following the formula:

$$FL (\%) = \frac{NP}{N} \times 100$$

Where Np was the number of THs who claim a use of a plant species to treat sinusitis and/or related symptom, and N was the total number of THs who mentioned the use of species as a medicine to treat any given condition (i.e. sinusitis and/related symptom/s). According to FRIEDMAN et al. (1986), FL index reflects the extent of preference an individual species is given by users in the management of a particular ailment. Fidelity level values show the percentage of THs claiming the use of particular plant species as herbal medicine for sinusitis.

Therefore, medicinal plants widely used by THs against sinusitis have higher FL values than those that are not widely used.

Use value (UV)

Use values (UV) are calculated for individual plant to give a quantitative measure of its relative importance to the informants' objectively. The extent of utilisation of each species used therapeutically by Bapedi THs for sinusitis and related symptoms were determined via UV, following PHILLIPS and GENTRY (1993) index:

$$UV = \frac{U}{N}$$

From the above formulation, U was the number of citations per species, where N represented the total number of THs. Generally, plant with broad therapeutic uses or those that are highly accepted as cure of a particular ailment will score a high UV.

Results and discussion

Diversity of used plant species

Forty-four plant species (38 indigenous and 6 exotics) belonging to 43 genera and 29 botanical families were pointed out by 132 interviewed Bapedi THs as treatment of sinusitis and related symptoms (Tab. 1). Amongst these families were the Fabaceae, Asteraceae, Euphorbiaceae and Lamiaceae with at least three species used against sinusitis. There is presently no ethnobotanical study focusing on traditional treatment of sinusitis which we can compare our finding with. However, members of the Asteraceae, Euphorbiaceae and Lamiaceae were previously reported as conspicuous therapies for respiratory infections in Northern Maputaland, KwaZulu-Natal Province, South Africa (YORK, 2012), thus suggesting that their pharmacological potential and safety against these infections have been ethnically tested in different areas by different culture and perchance found to be effective, hence they are highly preferred by Bapedi THs. In addition to this conjecture, the supremacy of the aforesaid families in our study might be attributed to THs' knowledge regarding uses of their members as sinusitis and related conditions medications compared to other families. The remaining botanical families encountered in this survey had between two and one species, thus were least presented. Poorly represented as these families were, the high degree and frequency of uses of most of their members by Bapedi THs appeared to be worthy of further in-depth investigations with respect to pharmacological activities (Tab. 1).

Plant habit

Trees (40.9%, n=18), followed by herbaceous species (36.3%, n=16) and shrubs (22.7%, n=10), respectively formed the highest floristic composition of 44 medicinal plants inventoried in the present study. Distinct partialities of the first habit by interviewed THs might be attributed to chronic nature of sinusitis which requires the incessant availability of medications. This speculation is based on the fact that trees are available year round as they are not affected by seasonal changes.

Distribution of used plants with in the municipalities and districts

Of all (n=44) the species documented in this study, only 22.7% (n=10), namely *Adansonia digitata*, *Clerodendrum ternatum*, *Cryptocarya transvaalensis*, *Enicostema axillare*, *Kalanchoe brachyloba*, *Lasiosiphon caffer*, *Moringa oleifera*, *Sclerocarya birrea*, *Siphonochilus aethiopicus* and *Stylochaeton natalensis* were widely used by all THs across the three studied sites, thus suggesting that their knowledge as sinusitis and its ailed symptoms cures is

common in Bapedi traditional sector. Medical information pertinent to 6.8% (n=3) of species (*Nicotiana tabacum*, *Encephalartos transvenosus* and *Lippia javanica*) were sparsely distributed amongst THs in certain municipalities within the three surveyed districts (Supplementary file: Tab. 2). Variability in use of these taxa across the studied sites is possibly due to the uneven distribution of knowledge among THs regarding their application as sinusitis cure. This supposition might be true especially since the acquisition and development of knowledge about medicinal plants is a lifelong process and more difficult to learn than other ethnobotanical uses (PHILLIPS and GENTRY, 1993). Similar sentiment can be said for taxa which were used by THs practicing in certain municipalities located in two of the three studied districts (*Acacia senegal*, *Adenia spinosa*, *Aloe* spp., *Artemisia afra*, *Eucalyptus camaldulensis*, *Peltophorum africanum*, *Protea caffra*, *Schkuhria pinnata*, *Senna italica*, *Sorghum bicolor*, *Vernonia natalensis* and *Warburgia salutaris*), and those used by THs in some municipalities under one of these districts (*Acacia tortilis*, *Citrus limon*, *Clematis brachiata*, *Euphorbia schinzii*, *Lantana rugosa*, *Mentha longifolia*, *Plumbago zeylanica*, *Psiadia punctulata* and *Schinus molle*). Ethnomedical knowledge of the remaining species encompassing *Acokanthera rotundata*, *Cannabis sativa*, *Carissa bispinosa*, *Croton gratissimus*, *Cyperus sexangularis*, *Erythrina lysistemon*, *Eucomis pallidiflora*, *Ptaeroxylon obliquum*, *Solanum panduriforme* and *Spirostachys africana* were restricted to THs operating in a single municipality within one of the three surveyed districts, a finding which indicate that these species are less popular amongst the interviewed THs. However, it is also probable that the limited uses of such taxa might be ascribed to their effectiveness against sinusitis, presently known to few THs who retaliate to share it with colleagues in trepidation of competition.

Species utilisation and comparison with ethnobotanical literature

Amongst the 44 plant species recorded in this study, vast majority (59%, n=26) were used by THs to exclusively treat sinusitis, 11.3% (n=4) cured this ailment and the following two conditions; fatigue and fever. The remaining plants (31.8%, n=14) was implicated in the treatment of both these disorders. Generally, the above-mentioned findings demonstrate the depth of Bapedi THs' indigenous knowledge on local plants and their application as cure for sinusitis and allied symptoms. Plants used exclusively by THs in this study to treat sinusitis were *Aloe* spp., *A. rotundata*, *A. senegal*, *A. tortilis*, *C. bispinosa*, *C. brachiata*, *C. gratissimus*, *C. transvaalensis*, *C. ternatum*, *E. axillare*, *E. lysistemon*, *E. pallidiflora*, *E. schinzii*, *K. brachyloba*, *L. caffer*, *S. aethiopicus*, *S. birrea*, *L. javanica*, *N. tabacum*, *P. africanum*, *P. caffra*, *S. africana*, *S. italica*, *S. natalensis*, *S. panduriforme* and *W. salutaris*. Not surprisingly, amongst these species, only *C. brachiata* (ROBERT, 1990) and *W. salutaris* (COOPOOSAMY AND NAIDOO, 2012), as well as *S. aethiopicus* (MANZINI, 2005) were previously reported as being used by other South African cultures, specifically the Zulu and Swazi THs, respectively as treatment of this disease. This came as no surprise due to the fact that currently there is no ethnobotanical study that focused on the medicinal plants used by THs or lay people for sinusitis. However, the fact that there is literature based proof highlighting on the use of above three stated species for this RI by THs of afore-mentioned cultures, suggests that other South African healers do treat the condition, and thus a through exploration and documentation of their related ethnobotanical knowledge should be prioritised before it is irretrievably lost together with the holders. *Clerodendrum ternatum*, *C. transvaalensis*, *E. axillare*, *K. brachyloba*, *L. caffer*, *S. birrea*, *S. aethiopicus* and *S. natalensis* were used by all interviewed Bapedi THs (n=132) who treated sinusitis in this study, thus indicating that they are pharmacologically active and principal in the treatment of this condition.

Tab. 1: Medicinal plants used by Bapedi traditional healers to sinusitis and related symptoms in the Limpopo Province, South Africa

Botanical family	Species name	Vernacular name	Habit	Used plant parts	State of use	Methods of herbal preparation and administration	Aliment/s treated	Frequency of use; N=THs (132)		FL	UV
								UM	%		
Anacardiaceae	<i>*Schinus molle</i> L.	Thoba/Mokwepere	Tree	Leaf	Fresh	Boiled for 5–7 minutes. Steam is inhaled (nasally) under blanket. Thrice a day	Fever	10	7.5	100	0.07
Anacardiaceae	<i>Sclerocarya birrea</i> (A.Rich.) Hochst. subsp. <i>caffra</i> (Sond.)	Morula/Mokano	Tree	Fruit	Fresh	Juice is squeezed (raw), dried and powdered. Powder is poured in the hot water. Steam is inhaled (nasally) under blanket. Thrice a day	Sinusitis	132	100	100	1
Apocynaceae	<i>Acokanthera rotundata</i> (Codd) Kupicha	Moethi	Shrub	Root	Dry	Boiled for 3–6 minutes. Steam is inhaled (nasally) under blanket. Thrice a day	Sinusitis	4	3	100	0.03
Apocynaceae	<i>Carissa bispinosa</i> (L.) Desf. ex Brenan	Leputlo/Mothokolo/MoShukudu/Motholo	Tree	Root	Dry	Pounded and mixed with dried powdered root of <i>E. lysistemon</i> . Taken orally with warm water. Thrice a day	Sinusitis	1	0.7	100	0.00
Araceae	<i>Sylochaeton natalensis</i> Schott	Mokunya/Mokushete	Herb	Root	Dry	Boiled for 5 minutes. Steam inhaled (nasally) under blanket. Thrice a day	Sinusitis	132	100	100	1
Asphodelaceae	<i>Aloe</i> spp.	Thogo/Marobadibogale	Shrub	Leaf	Fresh	Macerated in warm water for 24hrs. Decoction is taken orally. Thrice a day	Sinusitis	5	3.7	100	0.03
Asteraceae	<i>Ariemisia afra</i> Jacq. ex Willd. var. <i>afra</i>	Legana/Moilansi	Herb	Leaf	Fresh	Mixed with dried leaf of <i>L. javanica</i> . Boiled for 5 minutes. Extract is taken orally. Thrice a day	Sinusitis	1	0.7	50	0.00
Asteraceae	<i>Psiadia punctulata</i> (DC.) Vatke	Lesotlane/Monotletsane/lesodi	Shrub	Root	Dry	Boiled for 4–5 minutes. Steam is inhaled (nasally) under blanket. Thrice a day	Fever	1	0.7	50	0.00
Asteraceae	<i>*Schkubria pinnata</i> (Lam.) Kuntze ex Thell.	Šathume/Mošasane/Seralane	Herb	Whole plant	Fresh	Pounded and taken orally with warm water. Thrice a day	Fever	10	7.5	100	0.07
Asteraceae	<i>Fernonia natalensis</i> Sch.Bip. ex Walp.	Mošuhla	Herb	Leaf	Dry	Pounded and taken orally with warm water. Thrice a day	Sinusitis	6	4.5	37.5	0.12
Canellaceae	<i>Harburgia salutaris</i> (G.Bertol.) Chiov.	Molaka	Tree	Bark	Dry	Boiled for 4–11 minutes. Extract is taken orally. Thrice a day	Sinusitis	4	3	100	0.03
Cannabaceae	<i>*Cannabis sativa</i> L. var. <i>indica</i> (Lam.) Wehmer	Lebake/Paiše	Herb	Leaf	Dry	Pounded and taken orally with warm water. Thrice a day	Fever	1	0.7	100	0.00
Crassulaceae	<i>Kalanchoe brachyloba</i> Welw. ex Britten	Moethi/Mošimane/wanaga/Mori tšikana	Shrub	Leaf	Fresh	Rubbed (raw) between hands and vapour is inhaled (nasally). Thrice a day	Sinusitis	132	100	100	1
Cyperaceae	<i>Cyperus sexangularis</i> Nees	Mohlhlahla	Herb	Root	Dry	Pounded and taken orally with warm water. Thrice a day	Fever	1	0.7	100	0.00
Euphorbiaceae	<i>Croton gratissimus</i> Burch. var. <i>gratissimus</i>	Moolologa/Selogane	Tree	Root	Dry	Boiled for 6–10 minutes. Extract is taken orally. Thrice a day Or Pounded and taken orally with warm water. Thrice a day	Sinusitis	5	3.7	100	0.03
Euphorbiaceae	<i>Euphorbia schinzii</i> Pax	Ngaka-dianya	Herb	Root	Dry	Boiled for 5–8 minutes. Steam is inhaled (nasally) under blanket. Thrice a day	Sinusitis	7	5.3	100	0.05

Euphorbiaceae	<i>Spirostachys africana</i> Sond.	Morekuri/Motampota	Tree	Root	Dry	Burned for about 7–8 minute. Smoke inhaled (nasally). Thrice a day	Sinusitis	2	1.5	100	100	0.01
Fabaceae	<i>Acacia senegal</i> (L.) Willd. var. <i>rostrata</i> Brenan	Mokgaripe	Tree	Root	Dry	Boiled for 6–11 minutes. Extract is taken orally. Thrice a day	Sinusitis	4	3	100	100	0.03
Fabaceae	<i>Acacia tortilis</i> (Forssk.) Hayne subsp. <i>heteracantha</i> (Burch.) Brenan	Moshwana	Tree	Root	Dry	Boiled for 5 minutes. Steam is inhaled (nasally) under blanket. Thrice a day	Sinusitis	11	8.3	100	100	0.08
Fabaceae	<i>Erythrina lysistemon</i> Hutch.	Sebalo/Mmale	Tree	Bark	Dry	Pounded and mixed with dried powdered root of <i>C. bispinosa</i> . Taken orally with warm water. Thrice a day	Sinusitis	1	0.7	100	100	0.00
Fabaceae	<i>Peltophorum africanum</i> Sond.	Mosehla	Tree	Bark	Dry	Boiled for 5–11 minutes. Extracts taken orally. Thrice a day	Sinusitis	7	5.3	100	100	0.05
Fabaceae	<i>Senna italica</i> Mill. subsp. <i>arachoides</i> (Burch.) Lock	Morotladitshosi	Herb	Root	Dry	Boiled for 4–8 minutes. Extract is taken orally. Thrice a day	Sinusitis	5	3.7	100	100	0.03
Gentianaceae	<i>Encostema axillare</i> (Lam.) A.Raynal subsp. <i>Axillare</i>	Makgonotsohle/Mphedu-yathaba	Herb	Whole plant	Dry	Boiled for 5–14 minutes. Extract is taken orally. Thrice a day Or Pounded and taken orally with warm water. Thrice a day	Sinusitis	132	100	100	100	1
Hyacinthaceae	<i>Eucomis pallidiflora</i> Baker subsp. <i>pole-evansii</i> (N.E.Br.) Reyneke ex J.C.Manning	Mathubadifala	Herb	Bulb	Fresh	Boiled for 5–10 minutes. Extract is taken orally. Thrice a day	Sinusitis	1	0.7	100	100	0.00
Lamiaceae	<i>Clerodendrum ternatum</i> Schinz	Sebokane	Herb	Whole plant	Dry	Boiled for 5 minutes. Steam inhaled (nasally) under blanket. Thrice a day	Sinusitis	132	100	100	100	1
Lamiaceae	<i>Mentha longifolia</i> L.	Mominti	Herb	Whole plant	Dry	Boiled and extract is taken orally. Thrice a day	Fever	10	7.5	100	100	0.07
Lauraceae	<i>Cryptocarya transvaalensis</i> Burt Davy	Kgosupsa	Tree	Bark	Dry	Boiled for 5–9 minutes. Extract is taken orally. Thrice a day Pounded and poured in boiled water. Steam is inhaled (nasally) under blanket. Thrice a day	Sinusitis	41	100	100	100	1
Malvaceae	<i>Adansonia digitata</i>	Mogoo	Tree	Root	Dry	Boiled for 6–10 minutes. Extract is taken orally. Thrice a day	Fatigue	132	100	100	100	1
Moringaceae	* <i>Moringa oleifera</i> sensu Exell & Mendon	Moringka	Tree	Leaf	Dry	Pounded and taken orally with warm water. Thrice a day	Fatigue	132	100	100	100	1
Myrtaceae	<i>Eucalyptus camaldulensis</i> Dehnh	Moplikomo	Tree	Bark	Dry	Boiled for 5 minutes. Steam is inhaled (nasally) under blanket. Thrice a day	Sinusitis	1	0.7	9	90.9	0.08
Passifloraceae	<i>Adenia spinosa</i> Burt Davy	Monna-apare/Pisayabašumi/Mothema	Shrub	Stem	Dry	Pounded and taken orally with warm water. Thrice a day	Fatigue	6	4.5	100	100	0.12
Plumbaginaceae	<i>Plumbago zeylanica</i> L.	Mašimabe/Mašegomabe	Shrub	Root	Dry	Boiled for 5 minutes. Steam is inhaled (nasally) under blanket. Thrice a day Boiled for 6–13 minutes. Extract is taken orally. Thrice a day	Sinusitis	10	7.5	100	100	0.07
Poaceae	<i>Sorghum bicolor</i> (L.) Moench subsp. <i>anundinaceum</i> (Desv.) de Wet & Harlan	Mabele-thoro	Herb	Seed	Dry	Pounded and taken orally with Mageu® drink or soft porridge. Thrice a day	Fatigue	18	13.6	100	100	0.13

Proteaceae	<i>Protea caffra</i> Meisn. subsp. <i>caffra</i>	Modumela	Tree	Root	Dry	Pounded and taken orally with warm water. Thrice a day	Sinusitis	2	1.5	100	0.01
Pteroxylaceae	<i>Pteroxylon obliquum</i> (Thunb.) Radlk.	Mogabaletswana	Tree	Root	Dry	Pounded and taken orally with warm water. Thrice a day	Fever	4	3	100	0.03
Ranunculaceae	<i>Clematis brachiata</i> Thunb.	Motlemapoo/Makgwaitiane	Herb	Root	Dry	Burned for about 5–6 minutes. Smoke is inhaled (nasally). Thrice a day	Sinusitis	10	7.5	100	0.07
Rutaceae	* <i>Citrus limon</i> (L.) Burm.f.	Moswiri	Tree	Bark	Dry	Pounded and taken orally with warm water. Thrice a day	Fever	10	7.5	100	0.07
Solanaceae	* <i>Nicotiana tabacum</i> L.	Mofola	Shrub	Leaf	Dry	Pounded and a pinch of a finger is snuff (nasally). Thrice a day	Sinusitis	3	2.2	100	0.02
Solanaceae	<i>Solanum panduriforme</i> E.Mey.	Mothola-o-moserolwane	Herb	Root	Dry	Pounded and taken orally with warm water. Thrice a day	Sinusitis	4	3	100	0.03
Thymelaeacea	<i>Lastosiphon caffra</i> Meisn.	Nkekologe	Shrub	Root	Dry	Pounded and poured in boiled water. Steam is inhaled (nasally) under blanket. Thrice a day	Sinusitis	132	100	100	1
Verbenaceae	<i>Lantana rugosa</i> Thunb.	Bokokotane/mokokotane	Shrub	Leaf	Fresh	Boiled for 5–10 minutes. Steam is inhaled (nasally) under blanket. Thrice a day	Fever	10	7.5	100	0.07
Verbenaceae	<i>Lippia javanica</i> (Burm.f.) Spreng.	Mosunkwane/motlaba-dipoo	Shrub	Leaf	Fresh	Mixed with fresh leaf of <i>A. qfira</i> . Boiled for 5 minutes. Extract is taken orally. Thrice a day	Sinusitis	1	8.3	100	0.08
Zamiaceae	<i>Enephalarros transvenosus</i> Stapf & Burt Davy	Mofaka	Tree	Root	Dry	Boiled for 5 minutes. Extract is taken orally. Thrice a day	Fatigue	81	61.3	100	0.61
Zingiberaceae	<i>Siphonochilus aethiopicus</i> (Schweinf.) B.L.Burt	Serokolo	Herb	Bulb	Fresh	Boiled for 5–6 minutes. Steam is inhaled (nasally) under blanket. Thrice a day	Sinusitis	132	100	100	1

Key: Exotic plant species; asterisk (*), fidelity level; FL, use mention; UM and use value; UV

Therapies for sinusitis and accompanying symptoms

As noted earlier species multi-used by Bapedi for sinusitis and perceived symptoms (fatigue and fever) made-up 11.3%. Fatigue was cured with a single species (*A. spinosa*), and fever with three species namely *A. afra*, *E. camaldulensis* and *V. natalensis*. Traditional uses of *A. spinosa* as fatigue and sinusitis therapies are recorded in our study for the first time. This might be due to the fact that this species is only localised in selected areas of the Limpopo Province (FODEN and POTTER, 2005). Amongst the species used by Bapedi for fever and sinusitis, only their use for the first condition was previously reported in African literature. Our finding regarding use of *A. afra* as fever medicine concur with that of THRING and WEITZ (2005), who worked with the coloureds (mixed-race) people residing in the Bredasdorp/Elim region of the Southern Overberg, Western Cape Province of South Africa.

Similar to Bapedi THs, the Shona people of Zimbabwe use *E. camaldulensis* to treat this condition (MAROYI, 2011). Medicinal application of *V. natalensis* for fever was previously highlighted by GITHENS (1948) in South Africa. Thus therapeutic claims made on the aforesaid three plant species by Bapedi THs can be taken to be credible, given that they have identical uses elsewhere. Overall uses of these species in the treatment of fever and sinusitis in our study might be attributed to their strong aromatic flavour. This speculation is ascribed to the fact that most of the interviewed THs disclosed that all plant species with aromatic smell has the potential in the treatment of respiratory infections, particularly fever and sinusitis.

The remaining species recorded in this study were used exclusively for fever (*L. rugosa*, *M. longifolia*, *P. punctulata*, *P. zeylanica* and *S. molle*) and fatigue (*A. digitata*, *E. transvenosus*, *M. oleifera*, *S. bicolor* and *S. pinnata*) in patients diagnosed with sinusitis. Most of the aforesaid plants used by Bapedi THs to relieve fever are in line with findings of previous studies conducted in South Africa. For instance, Vhavenda THs practicing in Lwamondo area, Limpopo Province also use *L. rugosa* as fever medicine (MAHWASANE et al., 2013). Utilisation of *M. longifolia* by Bapedi THs coincides with findings of VAN WYK et al. (1997) who worked with the diverse South African cultures. Comparably to our results, DOLD AND COCKS (2000), found that Xhosa THs operating in the Grahamstown and Peddie districts of the Eastern Cape Province, South Africa also prescribe *S. molle* as medicine to relieve fever. The use this species by Bapedi might be attributed to its evergreen nature which supplies them with fresh leaves through the year for herbal preparation. No ethnobotanical record of the remaining two fever therapies; *P. punctulata* and *P. zeylanica* was found in South Africa. However, both *P. punctulata* (KOKWARO, 1976) and *P. zeylanica* (TYAGI AND MENGHANI, 2014) are also valued as fever medicines in east Africa, thus emphasising their importance as traditional medicine to heal this condition by interviewed Bapedi THs. In addition, it shows that the species are widely distributed in various geographical areas across Africa.

Amongst the medicinal plants documented as being used by Bapedi THs to heal fatigue in patients diagnosed with sinusitis, only *A. digitata* (WICKENS, 1979) and *M. oleifera* (METHA et al., 2011) are well supported by literature. The remaining species namely *E. transvenosus*, *S. bicolor* and *S. pinnata* are recorded for the first time in the present survey as fatigue medicine. Overall, new records of commonly known medicinal plants for sinusitis and perceived related symptoms in our study are an indication that the indigenous medical knowledge amongst the diverse South African cultures is poorly documented.

Fidelity level (FL) and use value (UV)

Analysis of all the 44 documented species in this study according to FL revealed *C. ternatum*, *C. transvaalensis*, *E. axillare*, *K. brachyloba*, *L. caffer*, *S. birrea*, *S. aethiopicus* and *S. natalensis* (UM=132 and FL=100; sinusitis for each), *A. digitata* and *M. olei-*

fera, (UM=132 and FL=100; fatigue, for each), *E. transvenosus* (UM=81 and FL=100; fatigue) and *S. bicolor* (UM=18 and FL=100; fatigue) as the most preferred. With exclusion of *E. transvenosus* and *S. bicolor* all these taxa scored the highest UVs of 1 against the mentioned ailments.

Plant parts used, mode of preparations, administrations and dosages

Anatomical part/s of the plant predominantly used in the present study to prepare herbal remedies included roots (43.1%, n=19), leaves (22.7%, n=10), bark (13.6%, n=6), whole plant (9%, n=4), bulb (4.5%, n=2), fruit, seed and stem (2.2%, n=1, for each), respectively. This finding reflects the extent of utilisation of these plant parts by Bapedi THs, a practice which could partly be attributed to either the effectiveness or local availability of such parts throughout the year. These plant parts were processed mainly in their dry (77.2%, n=34) state than when still drench (22.7%, n=10).

A total of 50 recipes were prepared by Bapedi THs in this study. Amongst these formulas, mono therapies (92%, n=46) based on preparations made from a single plant part were distinctively favoured. Herbal remedies which contained a mixture of plant parts (8%, n=4) harvested from various species was rarely used. The prevalence of mono therapies in this study might be attributed to its ease of preparation and safety, since there are no adverse drug interactions. In addition it might be attributed to its convenience for the patients, thus ensuring adherence in drug preparation. The plant parts combination during herbal preparation was reported by some THs in this study as augmenting the efficacy of medicine, a claim which is well supported by scientific studies (METHA et al., 2011; YORK et al., 2012).

The present study revealed that boiling (54%, n=27) and pounding (38%, n=19) was the most frequently employed method preparation for sinusitis and related symptoms treatments. Other techniques such as burning (4%, n=2), maceration, rubbing, pounding and squeezing (2%, n=1, for each) were less frequently utilised in this study. In general, boiling and burning durations of plant parts for medical production in this study varied amongst THs (Tab. 1). However, preparation of remedies via the remaining techniques was comparable amongst THs. Harvested plant parts were pounded by all THs with grinding stones. Maceration involved freshly harvested plant parts and the process was done by all THs overnight (24 hrs). Similarly, prescription which was made through rubbing and squeezing only involved fresh plant materials (Tab. 1).

Oral (62%, n=31) and nasal (38%, n=19), respectively were the only used means of administering prepared herbal remedies/recipes in the present study. However, nasal was the most flexible route of taking these recipes compared to oral. For instance, THs used it to administer medicines made via all the earlier noted techniques of herbal preparations in this study, while oral was only employed for recipes made via pounding and boiling (Tab. 1).

There was no standardized measure on the dose of most herbal remedies documented in this study. Uniformity in dosage strength amongst THs was only observed for oral drugs prepared via boiling; all Bapedi THs prescribed this medicine with a metal (500 ml) thrice a day. The recommended dosages of the remaining medications varied amongst THs. For instance, remedies prepared using part/s obtained from similar species was prescribed in different doses to treat similar complaints. This might be due to either THs preferences or experience.

Conclusions

The present study is the first to provide a comprehensive baseline data on the traditional practices associated with therapeutic plants for treatment of sinusitis and related symptoms in South Africa,

thus suggesting that there is still considerable scope for field work to explore and document these practices. Species documented in this study were described for the first time in ethnobotanical literature as treatment of sinusitis and related conditions. Therapeutic claims made by Bapedi THs on some plants are well supported by ethnobotanical literature and therefore, to some extent, corroborate the reliability of ethnobotanical information documented in this study.

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References

- ABERA, B., 2014: Medicinal plants used in traditional medicine by Oromo people, Ghimbi District, Southwest Ethiopia. *J. Ethnobiol. Ethnomed.* 10, 40. DOI: 10.1186/1746-4269-10-40
- AGBOR, M.A., NAIDOO, S., 2015: Ethnomedicinal plants used by traditional healers to treat oral health problems in Cameroon. *Evid. Based Complement Alternat. Med.* 2015. DOI: 10.1155/2015/649832
- AGRA, M.D.F., SILVA, N.K., BASILIO, I.J.L.D., FREITAS, P.F.D.F., BARBOSA-FILHO, J.M., 2008: Survey of medicinal plants used in the region Northeast of Brazil. *Braz. J. Pharmacog.* 18, 472-508. DOI: 10.1590/S0102-695X2008000300023
- AL-QURAN, S., 2009: Ethnopharmacological survey of wild medicinal plants in Showbak, Jordan. *J. Ethnopharmacol.* 123, 45-50.
- AWOYEMI, O.K., EWA, E.E., ABDULKARIM, I.A., ADULOJU, A.R., 2012: Ethnobotanical assessment of herbal plants in South Western Nigeria. *Acad. Res. Int.* 2, 50-57.
- BACHERT, C., HORMANN, K., MOSGES, R., RASP, G., RIECHELMANN, H., MULLER, R., 2003: An update on the diagnosis and treatment of sinusitis and nasal polyposis. *Allergy.* 58, 176-91.
- BHUWAN, K.C., ALI, N.A.A., SETZER, W.N., 2015: A survey of chemical compositions and biological activities of Yemeni aromatic medicinal plants. *Med.* 2, 67-92.
- COOPOOSAMY, R.M., NAIDOO, K.K., 2012: An ethnobotanical study of medicinal plants used by traditional healers in Durban, South Africa. *Afr. J. Pharm. Pharmacol.* 6, 818-823.
- DOLD, A.P., COCKS, M.L., 2000: The medicinal use of some weeds, problem and alien plants in the Grahamstown and Peddie districts of the Eastern Cape, South Africa. *S. Afr. J. Sci.* 96, 467-473.
- FODEN, W., POTTER, L., 2005: *Adenia spinosa* Burt Davy. National Assessment: Red List of South African Plants version 2015. Retrieved Feb. 7 2018, from <http://redlist.sanbi.org/species.php?species=2712-12>.
- FRIEDMAN, J., YANIVA, Z., DAFNIB, A., PALEWITCH, D., 1986: A preliminary classification of the healing potential of medicinal plants, based on a rational analysis of an ethnopharmacological field survey among Bedouins in the Negev Desert, Israel. *J. Ethnopharmacol.* 16, 275-287.
- GITHENS, T.S., 1948: *Drug Plants of Africa*; Africa Handbooks no. 8. University of Pennsylvania Press, Philadelphia.
- ISEH, K.R., MAKUSIDI, M., 2010: Rhinosinusitis: A retrospective analysis of clinical pattern and outcome in north western Nigeria. *Ann. Afr. Med.* 9, 20-26.
- KAYANI, S., AHMAD, M., ZAFAR, M., SULTANA, S., KHAN, M.P.Z., ASHRAF, M.A., HUSSAIN, J., YASEEN, G., 2015: Ethnobotanical uses of medicinal plants for respiratory disorders among the inhabitants of Gallies-Abbottabad, Northern Pakistan. *J. Ethnopharmacol.* DOI: 10.1016/j.jep.2014.08.005
- KOKWARO, J.O., 1976: *Medicinal Plants of East Africa*. East African Publishing Bureau, Nairobi.
- KOSE, L.S., MOTEETEE, A., VAN VUUREN, S., 2015: Ethnobotanical survey of medicinal plants used in the Maseru district of Lesotho. *J. Ethnopharmacol.* 170, 184-200. DOI: 10.1016/j.jep.2015.04.047
- MAHWASANE, S.T., MIDDLETON, L., BOADUO, N., 2013: An ethnobotanical survey of indigenous knowledge on medicinal plants used by the traditional healers of the Lwamondo area, Limpopo Province, South Africa. *S. Afr. J. Bot.* 88, 69-75.
- MANZINI, T.Z., 2005: Production of wild ginger (*Siphonochilus aethiopicus*) under protection and indigenous knowledge of the plant from traditional healers. M.Sc. dissertation. University of Pretoria, Pretoria.
- MAROYI, A., 2011: An ethnobotanical survey of medicinal plants used by the people in Nhema communal area, Zimbabwe. *J. Ethnopharmacol.* 136, 347-354. DOI: 10.1016/j.jep.2011.05.003
- MAVALE-MANUEL, S., JOAQUIM, O., MACOME, C., ALMEIDA, L., NUNES, E., 2007: Asthma and allergies in schoolchildren in Maputo. *Allergy.* 62, 265-271.
- MBENG, W.M., 2013: Antifungal evaluation and phytochemical analyses of selected medicinal plants used in the treatment of fungal diseases associated with HIV infection in the Eastern Cape Province, South Africa. University of Fort Hare, Alice.
- METHA, J., SHUKLA, A., BUKHARIYA, V., CHARDE, R., 2011: The magic remedy of *Moringa olifera*: An overview. *Int. J. Biomed. Adv. Res.* 2, 215-227.
- MINH, V.V., YEN, N.T.K., THOA, P.T.M., 2014: Medicinal plants used by the Hre community in the Bato district of central Vietnam. *J. Med. Plants Stud.* 2, 64-71.
- NAZRI, M., BUX, S.I., TENGKU-KAMALDEN, T.F., NG, T.-H., SUN, Z., 2013: Incidental detection of sinus mucosal abnormalities on CT and MRI imaging of the head. *Quant. Imaging Med. Surg.* 3, 82-88. DOI: 10.3978/j.issn.2223-4292.2013.03.06
- NRIAGU, J., ROBINS, T., GARY, L., LIGGANS, G., DAVILA, R., SUPUWOOD, K., HARVEY, C., JINABHAI, C.C., NAIDOO, R., 1999: Prevalence of asthma and respiratory symptoms in south-central Durban, South Africa. *Eur. J. Epidemiol.* 15, 747-755.
- NZUE, A.P.M., 2009: Use and conservation status of medicinal plants in the Cape Peninsula, Western Cape Province of South Africa. M.Sc. dissertation. University of Stellenbosch, Cape Town.
- OLUSESI, A.D., TSHIPUKANE, D.N., 2011: Management of allergic rhinitis and chronic rhinosinusitis in developing countries - focus on Africa. In: Akdis, C.A., Hellings, P.W., Agache, I. (eds.), *Global atlas of allergic rhinitis and chronic rhinosinusitis*. The European Academy of Allergy and Clinical Immunology, Zurich, Switzerland.
- PHILLIPS, O.L., GENTRY, A.H., 1993: The useful plants of Tambopata, Peru: II additional hypotheses testing in quantitative ethnobotany. *Econ. Bot.* 47, 33-43.
- RADOJICIC, C., 2012: Sinusitis. Retrieved Feb. 23 2018, from <http://www.clevelandclinicmeded.com>.
- RAMESHKUMAR, S., RAMAKRITINAN, C.M., 2013: Floristic survey of traditional herbal medicinal plants for treatments of various diseases from coastal diversity in Pudukkottai District, Tamilnadu, India. *J. Coast Life Med.* 1, 225-232.
- RIGHTDIAGNOSIS, 2016: Sinusitis: Retrieved 06 February 2018, from [Http://www.rightdiagnosis.com/sym/chronic_sinusitis.htm](http://www.rightdiagnosis.com/sym/chronic_sinusitis.htm).
- ROBERTS, M., 1990: *Indigenous Healing Plants*. Southern Book, Halfway House, South Africa.
- REULER, J.B., LUCAS, L.M., KUMAR, K.L., 1995: Sinusitis - A review for generalists. *West. J. Med.* 163, 40-48.
- SAMI, A.S., SCADDING, G., MALIK, M., AMJAD, M., 2013: Rhinitis, sinusitis and ocular disease - 2091. The MSYPQ: Repeatability and applicability to rhinitis/rhinosinusitis. *World Allergy Organ. J.* 6, 169. DOI: 10.1186/1939-4551-6-S1-P169
- SHI, J., FU, Q.L., ZHANG, H., 2015: Epidemiology of chronic rhinosinusitis: results from a cross-sectional survey in seven Chinese cities. *Allergy* 70, 533-539. DOI: 10.1111/all.12577
- SLAVIN, G.R., KALINER, M.A., KENNEDY, W.D., VIRANT, F.S., WALD, E.R., 2005: The diagnosis and management of sinusitis: A practice parameter

- update. *J. Allergy Clin. Immunol.* 116, 13-47.
DOI: 10.1016/j.jaci.2005.09.048
- SOUTHAFRICA.INFO, 2017: South African Geography. Retrieved Feb. 7, 2018, from [Http://www.southafrica.info/about/geography/limpopo.htm#V-uLO_v6vmQ](http://www.southafrica.info/about/geography/limpopo.htm#V-uLO_v6vmQ); 2016.
- SPIEGEL, J.H., 2004: Sinusitis. *Otolaryngol. Clin. North Am.* 37, 221-506.
- SUNALI, S.K., GHARPURE, A.S., 2012: Correlation of increased sinusitis and urban air pollution. *Indian J. Sci. Technol. Res.* 1, 14-17.
- THRING, T.S.A., WEITZ, F.M., 2005: Medicinal plant use in the Bredasdorp/ Elim region of the Southern Overberg in the Western Cape Province of South Africa. *J. Ethnopharmacol.* 103, 261-275.
DOI:10.1016/j.jep.2005.08.013
- TYAGI, R., MENGHANI, K., 2014: A review on *Plumbago zeylanica* : A compelling herb. *Int. J. Pharm. Sci. Rev. Res.* 5, 119-126.
- VAN WYK, B., OUDSHOORN, V., GERICKE, N., 1997: Medicinal plants of South Africa. Briza Publications, Pretoria.
- WICKENS, G.E., 1979: The uses of the baobab (*Adansonia digitata* L.) in Africa. In: Kunkel, G. (ed.), *Taxonomic aspects of African economic botany*. A.E.T.F.A.T. Las Palmas de Gran Canaria.
- WORRALL, G., 2011: Acute sinusitis. *Can. Fam. Physician.* 57, 565-567.
- YORK T., 2012: An ethnopharmacological study of plants used for treating respiratory infections in rural Maputaland. Podium presentation, Faculty of Science and Agriculture Annual Post-graduate Symposium. University of Zululand, Oct. 27 2011
- YORK, T., VAN VUUREN, S.F., DE WET, H., 2012: An antimicrobial evaluation of plants used for the treatment of respiratory infections in rural Maputaland, KwaZulu-Natal, South Africa. *J. Ethnopharmacol.* 31, 118-127. DOI: 10.1016/j.jep.2012.08.038

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Supplementary file: Tab. 2: Use of species to treat sinusitis (S) and related symptoms within the districts and municipalities

Species name	Districts and municipalities										Sum of overall ailment treated per species								
	Capricorn					Sekhukhune						Waterberg							
	Agangang	Blouberg	Lepelle-Nkumpi	Molemole	Polokwane	Sum of ailment (FC)	Elias Mtsosaledi	Ephrime Mogale	Fetakgomo	Makhudumathamaga		Tubatse	Sum of ailment (FC)	Bela-Bela	Lephale	Modimolle	Mogalakwena	Mookgophong	Thabazimbi
<i>Acacia senegal</i>	-	S:1	-	-	-	1	-	-	-	-	-	0	S:3	-	-	-	-	-	3
<i>Acacia tortilis</i>	S:1	-	-	S:10	-	11	-	-	-	-	-	0	-	-	-	-	-	-	0
<i>Acoenifera rotundata</i>	-	-	-	-	-	0	S:4	-	-	-	-	4	-	-	-	-	-	-	0
<i>Adansonia digitata</i>	FA:14	FA:15	FA:11	FA:13	FA:15	68	FA:13	FA:8	FA:6	FA:6	FA:6	41	FA:5	FA:1	-	FA:4	FA:8	FA:5	23
<i>Adenia spinosa</i>	-	-	-	-	-	0	-	-	-	-	-	6	-	-	-	-	-	-	0
<i>Aloe spp.</i>	S:7	-	S:1	S:1	S:2	10	-	-	-	-	-	0	-	-	-	-	-	-	0
<i>Artemisia afra</i>	S:1	-	-	-	S:2	4	-	S:1	-	-	-	1	-	-	-	-	-	-	0
<i>Artemisia afra</i>	-	-	-	-	-	0	-	-	-	-	-	0	-	FE:1	-	-	-	-	1
<i>Artemisia afra</i>	-	-	-	-	-	0	S:1"	-	-	-	-	1	-	-	-	-	-	-	0
<i>Cannabis sativa</i>	-	-	-	-	-	0	-	-	-	-	-	0	-	FE:1	-	-	-	-	1
<i>Carissa bispinosa</i>	S:1"	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	-	0
<i>Citrus limon</i>	-	-	-	-	-	0	-	-	-	-	-	0	-	FE:1	-	FE:1	FE:4	10	
<i>Clematis brachiata</i>	-	-	-	-	-	0	S:3	S:2	S:1	S:2	10	-	-	-	-	-	-	-	0
<i>Clerodendrum ternatum</i>	S:14	S:15	S:11	S:13	S:15	68	S:13	S:8	S:6	S:8	S:6	41	S:5	S:1	-	S:4	S:8	S:5	23
<i>Croton gratisimus</i>	-	-	-	-	-	0	-	-	-	-	-	0	S:5	-	-	-	-	-	5
<i>Cryptocarya transvaalensis</i>	S:14	S:15	S:11	S:13	S:15	68	S:13	S:8	S:6	S:8	S:6	41	S:5	S:1	-	S:4	S:8	S:5	23
<i>Cyperus sexangularis</i>	-	-	-	-	-	0	-	-	-	-	-	0	-	FE:1	-	-	-	-	1
<i>Eucaalyptus camaldulensis</i>	-	-	-	-	-	0	-	-	-	-	-	0	-	FE:1	-	FE:1	FE:4	10	
<i>Eucaalyptus camaldulensis</i>	-	-	-	-	-	0	-	S:1	-	-	-	1	-	-	-	-	-	-	0
<i>Enephalartos transvenosus</i>	FA:14	FA:15	FA:11	FA:13	FA:15	68	FA:2	-	FA:3	FA:2	FA:1	8	-	FA:2	-	FA:2	FA:1	-	5
<i>Enicostema axillare</i>	S:14	S:15	S:11	S:13	S:15	68	S:13	S:8	S:6	S:8	S:6	41	S:5	S:1	-	S:4	S:8	S:5	23
<i>Erythrina lysistemon</i>	S:1"	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	-	0
<i>Eucumis pallidiflora</i>	-	S:1	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	-	0
<i>Euphorbia schinzii</i>	-	-	S:4	S:1	S:2	7	-	-	-	-	-	0	-	-	-	-	-	-	0
<i>Kalanchoe brachyloba</i>	S:14	S:15	S:11	S:13	S:15	68	S:13	S:8	S:6	S:8	S:6	41	S:5	S:1	-	S:5	S:8	S:5	23
<i>Lantana rugosa</i>	-	-	-	-	-	0	-	-	-	-	-	0	-	FE:1	-	FE:1	FE:4	10	
<i>Lippia javanica</i>	S:2	-	-	-	-	2	S:1"	S:1	-	S:3	-	4	S:5	-	-	-	-	-	5
<i>Lasiosiphon caffer</i>	S:14	S:15	S:11	S:13	S:15	68	S:13	S:8	S:6	S:8	S:6	41	S:5	S:1	-	S:4	S:8	S:5	23
<i>Mentha longifolia</i>	-	-	-	-	-	0	-	-	-	-	-	0	-	FE:1	-	FE:1	FE:4	10	
<i>Moringa oleifera</i>	FA:14	FA:15	FA:11	FA:13	FA:15	68	FA:13	FA:8	FA:6	FA:6	FA:6	41	FA:5	FA:1	-	FA:4	FA:8	FA:5	23
<i>Nicotiana tabacum</i>	S:1	-	-	-	-	1	S:1	-	-	-	-	1	-	-	-	-	-	S:1	1
<i>Peitophorum africanum</i>	S:2	-	-	-	-	2	S:5	-	-	-	-	5	-	-	-	-	-	-	0
<i>Plumbago zeylanica</i>	-	-	-	-	-	0	-	-	-	-	-	0	-	FE:1	-	FE:1	FE:4	10	
<i>Protea caffra</i>	-	-	-	-	-	0	S:1	-	-	-	-	1	-	-	-	S:1	-	-	1
<i>Psidium punctulata</i>	-	-	-	-	-	0	-	-	-	-	-	0	-	FE:1	-	FE:1	FE:4	10	
<i>Ptaeroxylon obliquum</i>	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	FE:1	FE:4	10	
<i>Schinus molle</i>	-	-	-	-	-	0	-	-	0	-	-	0	-	FE:1	-	FE:1	FE:4	10	
<i>Schulmria pinnata</i>	FA:1	-	-	-	-	1	-	-	-	-	-	0	-	-	-	FA:4	-	-	4
<i>Sclerocarya birrea</i>	S:14	S:15	S:11	S:13	S:15	68	S:13	S:8	S:6	S:8	S:6	41	S:5	S:1	-	S:4	S:8	S:5	23
<i>Senna italica</i>	-	-	-	-	-	0	-	S:2	S:1	-	-	3	S:2	-	-	-	-	-	2
<i>Siphonochilus aethiopicus</i>	S:14	S:15	S:11	S:13	S:15	68	S:13	S:8	S:6	S:8	S:6	41	S:5	S:1	-	S:4	S:8	S:5	23
<i>Solanum panduriforme</i>	-	-	-	-	-	0	-	-	-	-	-	4	-	-	-	-	-	-	0
<i>Sorghum bicolor</i>	FA:2	FA:8	-	-	FA:2	12	-	-	-	-	-	6	-	-	-	-	-	-	0
<i>Sporostachys africana</i>	-	-	-	-	-	0	-	S:2	-	-	-	2	-	-	-	-	-	-	0
<i>Stylochaeton natalensis</i>	S:14	S:15	S:11	S:13	S:15	68	S:13	S:8	S:6	S:8	S:6	41	S:5	S:1	-	S:4	S:8	S:5	23
<i>Vernonia natalensis</i>	-	-	-	-	-	0	-	-	-	-	-	0	-	FE:1	-	FE:1	FE:4	10	
<i>Warburgia salutaris</i>	S:1	-	-	-	-	1	-	-	S:3	-	-	3	-	-	-	-	-	-	0

Key: fatigue; FA : fever; FE: lack of appetite; LA: sinusitis; S: sore throat; ST: Plain numeric indicate number of healers who use a species to treat an ailments whilst numeric with a quotation mark indicate number of healer/s who use a species in combination to treat an ailments