



Ethnobotanical Survey of Medicinal Plants of Tswapong North, in Eastern Botswana: A Case of Plants from Mosweu and Seolwane Villages

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Authors' contributions

This work was carried out in collaboration between all authors. Author DMT conceptualized the idea, collected the data and compiled the manuscript. Author GP did graphics on the results. All authors read and approved the final manuscript.

Research Article

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ABSTRACT

Ethnobotanical study to investigate the ethnomedicinal uses of plants by the Batswapong tribe, Eastern Botswana was done. This revealed a wealth of traditional knowledge on uses of medicinal plants. Thirty six plants distributed across twenty two families were recorded to treat sixty ailments. Most of these plants were trees (61%) with roots (82%) being the most frequently used parts for preparation of remedies across the twenty two families. For each species, its botanical family and vernacular name, medicinal uses, parts used and mode of preparation were documented. This study has revealed that knowledge on uses of medicinal plants is shrinking because of restrictions from religions, migration to urban areas, lack of interest by younger generations on uses of medicinal plants. The study concludes by advocating for the implementation of government policies that will significantly contribute towards the preservation of biodiversity and indigenous traditional knowledge of medicinal flora.

Keywords: *Ethnobotany; medicinal plants; survey; uses; Eastern Botswana.*

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1. INTRODUCTION

The use of medicinal plants in the treatment of diseases has generated renewed interest in the recent times, as herbal preparations are increasingly being used in both human and animal healthcare systems [1,2,3]. Eastern Botswana particularly Tswapong Hills, has mixed vegetation ranging from small bushes to dense savannah and mopane woodland and is home to a vast collection of plants upheld in folklore as having useful medicinal value. Many of the plants found in this region are very similar to what the San and Khoisan [4] cultures of South Africa have historically used for primary healthcare. The almost complete lack of systematic ethnobotanical records for Tswapong region is noteworthy. Most studies on plants of Botswana have focused on plants used for food [5, 6]. Ethnobotanical studies are often significant in revealing locally important plant species especially for the discovery of crude drugs [7]. From historic time, the documentation of traditional knowledge especially on the medicinal uses of plants has provided many important drugs of modern day [8,9,10]. Traditional medicine still remains the main resource for majority (80%) of people in developing countries for treating health problems, particularly because medicinal plants are accessible and cheap [11,12]. Additionally, the use of medicinal plants by the Batswapong ethnic group is embedded within their culture. In Botswana, there is limited development of therapeutic products and the indigenous knowledge on usage of medicinal plants as folk remedies is getting lost owing to migration from rural to urban areas, industrialization, rapid loss of natural habits and changes in lifestyle [6]. There is also lack of ethnobotanical surveys carried out in most parts of the country. In view of these observations, documentation of the traditional uses of medicinal plants is an urgent matter and important to preserve the knowledge. The purpose of this study was to investigate the traditional uses of medicinal plants by the ordinary people in Seolwane and Mosweu Villages in eastern Botswana. The study will provide baseline data for future pharmacological and phytochemical studies.

2. MATERIALS AND METHODS

The survey was conducted in the village of Seolwane (S22°39'12.0 ; E027°42'13.9) and Mosweu (S20°39'20.5 ; E027°39'04.2) settlement. These settlements are situated in Tswapong North in Central District of Botswana. All field work was done in October 2001 and April 2002 using semi structured questionnaire [13] and rapid appraisal approach. Verbal permission from the Village chiefs was obtained before embarking on the study. The author (DMT) was born and grew up in Seolwane village and was therefore, familiar with the local people and some of the traditional plants used in the region. In addition, the author's parents are both known herbalists and unreservedly provided the ethnobotanical data. Eight other local experts were interviewed. The use of the local dialect (Language) allowed the author to capture and accurately record subtle nuances that would normally be lost during interpretation and translation.

Herbarium voucher specimens were collected for all except for the most common and well-known species and deposited at the Gaborone National Herbarium and art Gallery, Botswana. Plants were identified by a trained taxonomist (Dr Bruce Heagreaves, PhD) and by the author (DMT). The plants identities were further confirmed by comparison with Herbarium material at the National Herbarium. The literature review was conducted by means of visiting various reference sources on recorded biological and phytochemical activity of many of the species.

2.1 Location and Study Area

The surveys focused on villages of Seolwane and Mosweu (Figs.1a & 1b). Ethnic groups involved in the studies were Batswapong and Batalaote. Seolwane is located 370km from the capital city Gaborone and consists of 3000 households. Mosweu is 380km from Gaborone and consists of 2000 households. The two villages are 5km away from each other. Ratholo village is also in Tswapong and is separated from Mosweu and Seolwane by a long range of Tswapong Hills. Ethnic communities residing in Ratholo are Batswapong. This ethnic group turns to the forest for their daily needs and also for income generation. Produce such as edible wild fruits [6] and medicinal plants are gathered and sold widely for an additional income. The vegetation cover of the study area can be classified as lowland riverine mixed mopane woodland. At higher elevations, the region is predominantly rocky Tswapong Hills (home to many rare edible wild fruits and medicinal plants).

3. RESULTS AND DISCUSSION

A total of 36 species of medicinal plants were encountered during the survey.

3.1 Floristic Composition and Medicinal Applications

A total of 69 medicinal uses derived from 36 species of plants belonging to 22 botanical families were gathered and documented in this research. Together with a vast repertoire of plant indigenous use, these therapies also involve ritualistic practices with ancestral connections.

Table 2. lists the plant species and families. Each plant is presented with its corresponding local name, medicinal use indicating the part used, method of preparation and method of administration. Details of type of plant are also indicated here. From the botanical point of view, the species used in preparation of remedies are represented by trees, herbs, shrubs, tubers. Trees were the dominant sources of parts used for remedies (Fig. 2). Since the studied area is mostly tree savanna woodland, the most abundant plant type is a tree. It is believed that the more abundant a plant is, the more medicinal virtues it may possess [14,15]. The most frequently used parts for preparation of remedies were the roots (Fig. 3; Fig. 4) both across botanical family and species distribution. This observation is in agreement with other studies [16] where an ethnoveterinary plant survey in Ethiopia established that roots are more commonly collected parts in ethnomedicinal practice. Similar observations [7] also established that the most frequently utilized plant part in traditional herbal medicine, was the underground part (root/rhizome/tuber). In most of the recipes, the herbal preparations are administered orally and the specific amount could not be ascertained, though some informants mentioned dosages such as tea cup twice daily for a month (e.g in the treatment of backache by *Cassisa abbreviata* root extract). The study has also revealed that the most common ailments for which the plants are used were inflammation and pain, cough, wounds, epilepsy and gastrointestinal disorders. Some plants were also reported to possess aphrodisiac properties and also used in treatment of reproductive disorders such as female infertility. The use of traditional herbal remedies in treatments of many ailments is a common practice all over the world [2,17,18,19]. The reliance on medicinal plants for health care is associated with poverty and the traditional belief about plant effectiveness [15].

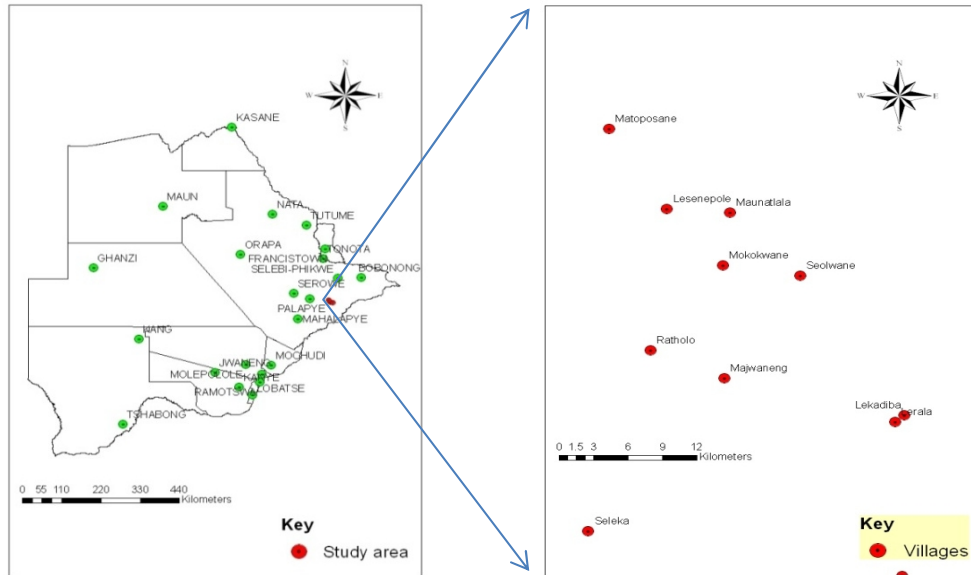


Fig.1a. Map of the studied area

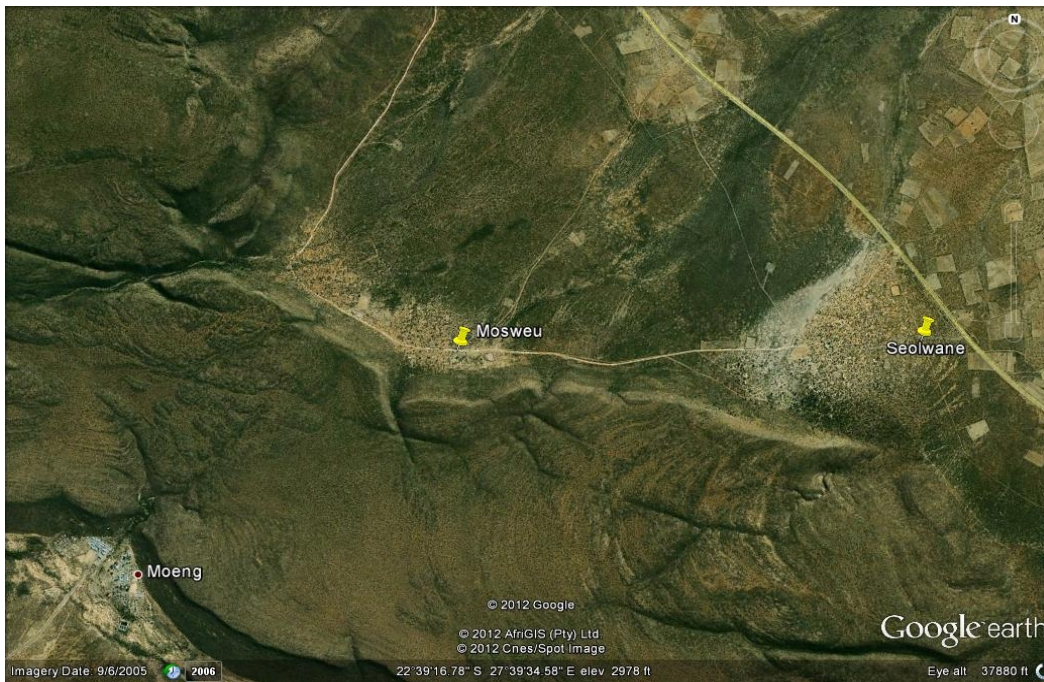


Fig. 1b. GPS Map of the study area and Tswapong Hills

This study has also revealed several interesting new uses that were recorded for well-known medicinal plants. Noteworthy examples are: bathing the vagina with water extract from stem bark of *Sclerocarya birrea* strengthens vaginal muscles; taking powdered root extract of

Ximenia caffra in beer has aphrodisiac activity; whilst juice squeezed from ripened *S.birrea* fruits treats ophthalmitis (herbalist [MB]).

When the interviewed experts (Table 1) were asked why they preferred roots from trees, the explanation was that it is a practice they acquired from one generation to another. Other experts mentioned that they copied this from wild animals which dig and eat roots of particular plants. Another explanation given was that the selection of plant part used was based on its resemblance to the ailment it is used to treat (*Doctrine of signatures* i.e the physical form of a plant or its part gives a clue to its healing purposes). It was mentioned that, in this regard it is mostly the roots that take resemblances of the ailments they treat (e.g roots that are coiled like snakes are used as snakebite antidote, gums and resins from trees are used to treat wounds; red sap from roots is used to treat blood disorders). The preference for root to prepare traditional remedies follows the scientific reasoning that roots generally contain high concentrations of bioactive compounds [20]. From the conservation point of view, harvesting of roots for medicinal uses can lead to depletion of these plants. Herbalists and experts in the studied region mentioned that they were aware of this and when they harvest the roots, they do not cut all the roots. Some of them mentioned the need for scientific intervention such as; domestication of the most after-sought plants in botanical gardens, analysis of other plant parts to see if they contain the same active ingredients found in the roots. In the light of conservation, some communities in Eastern Botswana have been supported by the government to remove plants from the bush for *ex situ* cultivation in village botanical gardens.

Table 1. List of local experts that were interviewed about traditional plant use

Name of expert	Geographical origin	Origin of knowledge
Motlhanka Bafedile (MB)	Seolwane	Personal experience and from father (Traditional healer)
Ntsebe Motlhanka (NM)	Seolwane	Personal experience and from grandmother (Herbalist)
Gababoloke Kgakgala (GK)	Mosweu	Father (Traditional Healer)
Letodi Maruapula (LM)	Seolwane	Personal experience (Spiritual Healer)
Tirafalo Tseleng (TT)	Mosweu	Mother (Herbalist)
Tshekiso Motlhanka (TM)	Seolwane	Father (Herbalist)
Merafhe Tirafalo (MT)	Mosweu	Grandfather (Herbalist)
Mangadi Mangadi (MM)	Ratholo (resides in Mosweu)	Grandfather (Herbalist)

Table 2. Ethnobotanical information of the studied medicinal plants

Species (Family name)	Common names (English name)	Medicinal uses	Part used	Mode of preparation	Plant type
<i>Cardiospermum corindum</i> L. (SAPINDACEAE)	Magwadane (Not stated)	Mouth ulcers	Root	Boiled root extract gurgled [NM] Root extract drunk [21]	Herb
<i>Cassia abbreviata</i> Oliv. (CAESALPINIACEAE)	Monepenepene (Sjambok pod)	Snakebite Ophthalmia [22] Back ache	Root	Eyes bathed with root extract Root extract drunk[MB]	Tree
<i>Cassine transvaalensis</i> (Burt Davy) Codd (CELASTRACEAE)	Monamane (Transvaal saffron)	Back ache Menorrhagia	Roots Stem	Root bark drunk [MB] Infusion of root extract drunk [23]	Tree
<i>Clerodendrum ternatum</i> Schinz (VERBENACEAE)	Sedupapula (Dwarf cat's whiskers)	Sore eyes Epileptic fits	Roots	Root decoction drunk Root powder in beer[GM]	Herb
<i>Colophospermum mopane</i> (J.Kirk. ex. Benth) J. Leonard (CAESALPINIACEAE)	Mophane (Mopane)	Asthma	Seeds	Seeds boiled in water, vapours inhaled[GK]	Tree
<i>Combretum hereroense</i> Schinz. (COMBRETACEAE)	Mokabi (Russet bushwillow)	Headache Female infertility[23]	Fruits Roots	Fruits boiled as Tea[GM] Roots boiled and drunk	Tree
<i>Combretum imberbe</i> Waura (COMBRETACEAE)	Motswere (Lead wood)	Diarrhoea	Root/stem	Stem/root decoction drunk Ash and sap from leaves mixed [GK].	Tree
<i>Commiphora glandulosa</i> Schinz (BURSERACEAE)	Mothapo (Tall common corkwood)	Toothpaste Skin inflammation and infections Wounds	Stem Gum- resins	Skin/wound bathed with resin water extract[TT];[GK]	Tree

<i>Commiphora marlothii</i> Engl. (BURSERACEAE)	Mphaphama (Paperbark corkwood)	Cough	Stem bark flakes	Stem bark burnt and smoke inhaled[MB]	Tree
<i>Croton megalobotrys</i> Mull-Arg. (EUPHORBIACEAE)	Moshoole (Large fever berry)	Purgative	Stem bark	Bark powder taken in porridge[NM]; [23]	Tree
<i>Drimia sanguinea</i> (Schinz) Jessop (LILIACEAE)	Sekaname (Transvaal slangkop)	Female infertility Venereal Diseases Blood purification	Tuber	Extract of tuber /bulb drunk[GK]	Forb/Bulb
<i>Elephantorrhiza burkei</i> Benth (MIMOSACEAE)	Mositsane (Sumach bean)	Vomiting Miscarriage	Tubers	Tuber infusion drunk[GK]; Root decoction drunk [24]	Tree
<i>Euclea undulata</i> Thunb. Var. myrtina (Burch) Hiern. (EBENACEAE)	Mothakolana (Common guarri)	Toothache	Root	Root powder rubbed /root chewed [NM]	Small tree or shrub
<i>Gardenia volkensii</i> K. Schum. (= <i>G. spathulifolia</i> (Stapf. Hutch.) Verdc. (RUBIACEAE)	Morala (Savanna gardenia)	Purgative Convulsions [23] Syphilis	Roots, bark	Root bark extract drunk[MM] Bark extract as a wash[MB]	Tree
<i>Gymnosporia buxifolia</i> Sazyszyl=(<i>Maytenus heterophylla</i> (Eckl.et Zeyh.)Robson (CELASTRACEAE)	Mothono (Common spikethorn)	Measles Syphilis	Leaves Roots	Root infusion taken internally and externally[MB] Leaf decoction rubbed on the skin[GM] Root decoction drunk [21]	Tree
<i>Harpagophytum procumbens</i> DC (PEDALIACEAE)	Sengaparile (Kalahari Devil's Claw)	Epilepsy Pain, ulcers, Wounds	Tubers	Dried tuber boiled and drunk [MM] Powder applied [GK]	Herb
<i>Indigofera flavicans</i> Bak. (LEGUMINOSAE) / FABACEAE	Tshikadithata	Aphrodisiac	Roots	Root decoction drank in beer[MB]	Herb
<i>Jatropha erythropoda</i> Pax (EUPHORBIACEAE)	Thotamadi	Kidney problems	Tuber	Boiled and mixed with <i>Ximenia caffra</i> [MB]	Herb

<i>Jatropha zeyheri</i> Sond (EUPHORBIACEAE)	Seswagadi	Irregular periods Miscarriage Open sores	Tuber	Tuber maceration drunk[NM] Plant sap applied[GK]	Herb
<i>Kirkia acuminata</i> Oliv. (SIMAROUBACEAE)	Modumela (White siringa)	Snakebite antidote	Branch Fibres/ Fruit Root	Fruit sap applied [23] Root decoction drunk [GK]	Tree
<i>Lippia javanica</i> (Burm.f.) Spreng. (VERBANACEAE)	Mosukudu (Fever Tea/ lemon bush)	Coughs Cough, Colds	Leaves	Vapour of hot infusion[NM]	Shrub
<i>Lippia scaberrima</i> Sond (VERBANACEAE)	Mosukujane (Lemon bush)	Fever, Colds	Leaves	Vapour of hot leaf infusion[NM]	Shrub
<i>Myrothamnus flabellifolius</i> (Sond) Welw. (MYROTHAMNACEAE)	Galalatshwene (Resurrection plant)	Asthma	Shoot	Leaves burnt/smoke inhaled [GK]	Shrub or sub shrub
<i>Ozoroa paniculosa</i> Sond (ANACARDIACEAE)	Monokana (Common resin tree)	Epilepsy pain		Pulverized whole plant eaten in porridge [GK] Leaf decoction drunk [23]	Tree
		Uterine pain	Root	Pulverised roots with latex drunk[NM]	
<i>Pavetta gardeniifolia</i> A Rich. Var. <i>subtomentosa</i> K.Schum. (RUBIACEAE)	Molemo monate (Common bride's bush)	Acute inflammation of chest[25] Period pains Female infertility	Stem	Root bark drunk[GK]	Shrub
		Antimalaria Antiplasmodial [26] Fevers [27]	Leaves	Decoction drunk to treat female infertility[NM] Leaf and root vapours inhaled[MT]	
<i>Peltophorum africanum</i> Sond (CAESALPINIACEAE)	Mosetlha (Weeping wattle)	Wounds	Stem bark	Pulverized bark drunk	Tree
		Placenta retention in livestock Ophthalmia	Leaves	Eyes exposed to vapours of bark/leaf decoction[TT]; [28]	

<i>Plumbago zeylanica</i> L. (PLUMBAGINACEAE)	Masigomabe (Wild leadwort)	Aphrodisiac	Roots	Roots boiled and drunk[GK]	Herb
<i>Pseudolachnostylis maprouneifolia</i> Pax (EUPHORBIACEAE)	Mojaphuti, Mosoto (Kudu berry)	Aphrodisiac	Stem bark	Stem powder in porridge [GK] Bark drunk in beer [NM];[29]	Tree
<i>Sclerocarya birrea</i> subsp. <i>caffra</i> Sond (ANACARDIACEAE)	Morula (Marula)	Livestock fattener Malaria Uteral sores Strengthen vaginal muscles	Fruits Bark	Bark extracted in alcohol and drunk daily[GK] Vagina bathed with concentrated stem bark extract	Tree
<i>Securidaca longependunculata</i> Fresen (POLYGALACEAE)	Mmaba (Violet tree)	Coughs Aphrodisiac Back pain	Stem bark Fruits Root	Juice from Ripe fruits squeezed into itching eyes[MB] Boiled root drunk Root decoction drunk in beer[MT] Root infusion drunk [24]	Tree
<i>Solanum kwebense</i> N.E Br. (SOLANACEAE)	Moroolwana (Bush tomato)	Diarrhoea in children	Roots	Root extract drunk[LM]-[MM]	Shrub
<i>Spirostachys africana</i> Sond (EUPHORBIACEAE)	Morukuru (African Mahogany tree)	Ophthalmia Kidney problems	Root	Vapours of root decoction directed into eyes [NM] [30]. Root maceration as enema [25]	Tree
<i>Terminalia sericea</i> Burch (COMBRETACEAE)	Mogonono (Silver cluster-leaf)	Diabetes Wounds	Stem bark Leaves	Powdered stem bark taken with corn meal[GK] Powdered leaves applied as dressing [31]	Tree

<i>Ximenia caffra</i> Sond. (OLACAEAE)	Moretologagomo (Sourplum)	Conjunctivitis	Leaves	Leaf decoction dropped into eyes [23]	Tree
		Aphrodisiac	Roots	Root powder taken in beer[TM].	
<i>Zehneria marlothii</i> (Cogn.) R.et.A.Fern (CUCURBITACEAE)	Phekolola (Donkey flower)	Head ache Stomach ache	Tubers	Dried powdered tubers eaten with porridge[LM];[NM]	Herb
<i>Ziziphus mucronata</i> Willd. (RHAMNACEAE)	Mokgalo (Buffalo thorn)	Urinary tract diseases	Roots	Root infusion drunk [23];[TM]	Tree
		Chronic cough Bed wetting		Root extract drunk [32]	

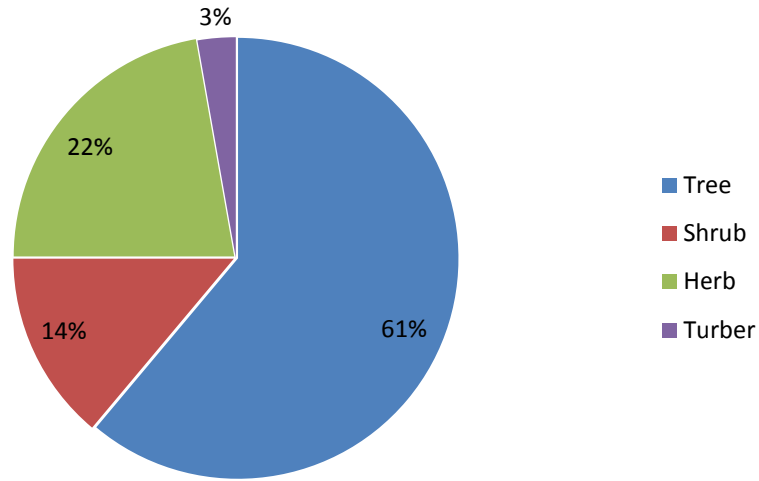


Fig. 2. Percentage of plant type of medicinal plants



Fig. 3. Percentage Botanical family distribution of plant parts used for preparation of remedies

The knowledge of medicinal plants in Tswapong communities is normally passed from generation to generation but this practice seems to be vanishing. It was estimated that there are only a few people in any village who are well versed on the medicinal usage of plant and such persons were usually the elderly. When the informants were asked if they still relied on herbal treatment, the response was that not all of the medicinal plants are used nowadays; the reasons advanced were that: the younger generation is generally unable to recognize the plants nor their traditional use; some religions do not allow the use of any biological material for medicines; some of the very useful medicinal plants are only known by the

elderly, but because they are old, their vision is now poor and this makes it difficult to recognize and identify the plants. In addition, the process of looking for the plants in the bush is laborious compared to going to a government health facility.

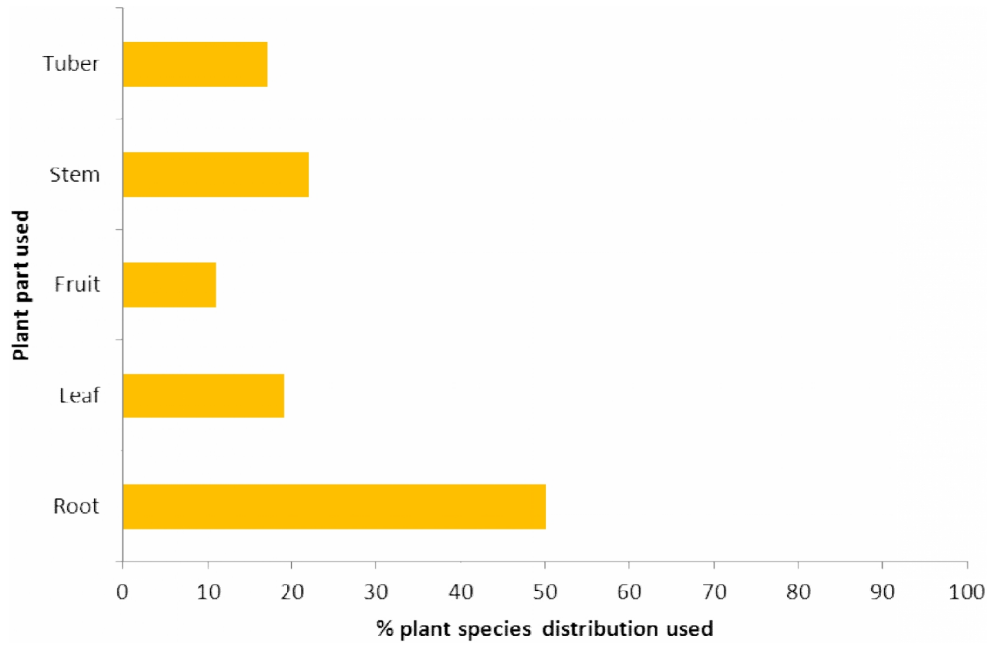


Fig. 4. Percentage species distribution of plant parts used for preparation of remedies

The expansion of the Seolwane village into this rich bush area is also threatening the biodiversity in this region. The reclamation of land for residence and farming in the studied area is also a concern. There is an urgent need for villagers and the government to be sensitized on the importance of indigenous traditional practices. The government authorities must be advised to promote policies that could lead to preservation of biodiversity for future generations. Domestication of these plants in botanical gardens should be done. However, such approach should be adopted concurrently with comparative laboratory phytochemical screening and biological assays that confirm consistency in biological activity between wild and domesticated plant species. If the traditional uses of these plants by various tribes are not documented, many of these plants may go extinct as a result of fast disappearance of natural ecosystem due to developments.

4. CONCLUSION

With a total of 69 recorded medicinal uses from 36 species corresponding to 22 botanical families, ethnomedicine in the studied area represent a fountain of untapped relevant traditional knowledge and a potential source of new lead compounds in the development of pharmacologically active therapeutic tools. Traditional uses of the studied plants ranged from treating inflammation or pain, snakebites, respiratory problems, reproductive disorders and infectious ailments. The most commonly treated ailment was pain. Across the studied botanical families, the roots were the most commonly used plant part. Due to relevance of native wild plants in improving health, the promotion of conservation approaches on

medicinal flora and biodiversity, particularly in the threatened studied area is needed. The information presented here, incomplete as it may be, could be helpful in future attempts to provide a more complete synthesis of Batswapong ethnomedicine. It is important to document the medicinal uses of traditional medicinal plants across the region before such knowledge is lost. Overall, the plants identified as herbal remedies in the management of various ailments, present considerable potential for further scientific research which may lead to the discovery of newer and perhaps safer drugs. It is therefore, recommended that further studies be conducted on all the above listed plants to validate their efficacy and safety.

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COMPETING INTERESTS

There are no competing interests in this work.

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