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Prospects for the Domestication of *Aloe mzimbana* in Zambia

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Abstract

Chishimba Falls is one of the several waterfalls of aesthetic value and tourist attraction in Zambia, located on the Luombe River, which forms part of the Bangweulu Basin drainage system. The geomorphological nature of Chishimba Falls is such that it consists of two waterfalls called the Mutumuna and Chishimba and the Kaela Rapids. The Chishimba Falls Heritage Site covers an area of 777 hectares. It is surrounded by human settlements and residences for staff of the Zambia Electricity Supply Corporation and the Zambia National Service. Out of a total of 314 plant species recorded at this site, 138 species of flowering plants are of ethnobotanical value. Vegetation studies conducted at this heritage site generated an idea on the prospects to domesticate species of *Aloe*, particularly *Aloe mzimbana*, as a source of pharmaceutical compounds.

Keywords: *Aloe mzimbana, Asphodelaceae, Ethnobotany, Medicinal plants*

1.0. Introduction

Zambia is endowed with several waterfalls of aesthetic value and tourist attraction. The most prominent being Victoria Falls near Livingstone. The Lumangwe Falls, located in Northern Zambia along the Kalungwishi River, possesses striking topographic features that present it as a 'mini-Victoria Falls'. Other waterfalls sites of tourist attraction in Zambia include the Kundalira Falls, the Ngonye Falls, the Kalambo Falls and the Chishimba Falls. The Chishimba Falls, which was the core site selected for ethnobotanical studies, is located on the Luombe River. This river, which originates north of Kasama in Senga Hill District, is one among several other riverine systems forming part of the Bangweulu Basin drainage system, which is a more or less circular depression.

The geomorphological nature of Chishimba Falls is such that it consists two waterfalls, the upper-most which is called the Mutumuna and the lower-most which is the real Chishimba Falls. The upper and lower waterfalls are separated by the Kaela rapids located in the middle of the two waterfalls. The site is situated along the Kasama-Mporokoso road, about 35km from the central town of Kasama (1,2).

2.0. Concept of Ethnobotany

Ethnobotany is a scientific discipline that has recently evolved to encompass diverse approaches to understanding how humans utilise plants and their inherent natural products. It has been observed that fields of ethnobotanical research mainly cover folklore taxonomy, the origin and domestication of cultivated plants, and include studies on the ecological effects of human activities upon plant communities(3). Ethnobotany, a relatively underdeveloped discipline in southern Africa, can also be defined as a study involving the use of plants by indigenous people[4]. Other authorities have defined ethnobotany as a discipline of plant sciences that involves studies relating to the mutual relationships between traditional people and plants in their environments(5). Throughout the existence of humans, knowledge relating to plant use has been passed on from parents to off-springs and from generation to generation. The ability to discriminate between edible and non-edible plants, or to differentiate between medicinal and non-medicinal plants, has been an essential factor for the survival of people(6).

The scope of ethnobotany has been expanded to encompass ethnomedicine, ethnotaxonomy and ethnoecology(5). In this regard, it has been observed that different regions of the world are evolving a diversity of approaches in the field of ethnobotany. In Asia, several ethnobotanical projects aim at documenting the knowledge of traditional medicinal plants(5). In Australia, the development of ethnobotanical research has been linked to the ecological management of vegetation types. Ethnoecology is thus, an area of ethnobotany that deals with the traditional knowledge of plant phenology, adaptation and interaction with other organisms(5). In the United States of America, programmes relating to the protection and propagation of valuable plants, which are indigenous to America have led to the development of a major Federal Government mandate that has been applied in the management of vegetation, including some aspects of environmental impact assessment, since the 1980s(3,5). In Africa, ethnobotanical practices are linked to incorporating indigenous plants into traditional agriculture. A case in point relates to the practice in Malawi and Zambia where weedy plants such as *Cleome gynandra* L and *Amaranthus hybridus* L are cultivated around villages as sources of vegetable foods (7). However, one of the leading ethnobotanical practices in Africa has been and still is the use of herbs as sources of medical care (5).

The classification of plants as food or medicinal plants has been necessitated through the application of names. Ideally, a plant that is not utilised by humans will not be assigned a name. For example, studies conducted by Phiri and Ochyra (1) reveal that no names have been attached to the 88 species of mosses, which have been documented in Zambia because the people do not utilise these lower plants. For this reason, *ethnobotany* is considered the study of plants used by indigenous peoples. According to Liengne(8), the objectives of ethnobotany include such themes as the identification of plants that have uses to humankind; the study of how people classify, identify and relate to useful plants; and the process of examining the reciprocal interaction of people and plants. However, in southern Africa, most ethnobotanical projects are in their early stages that involve identifying plants and

documenting their use. Having documented all plants of ethnobotanical value occurring at Chishimba Falls Heritage Site and the immediate surrounding areas(9), this article aims at focusing on prospects for the domestication of *Aloe mzimbana* I. Verdc and Christian, which is widespread in high-rainfall regions of Zambia.

3.0. Methodology

The Chishimba Falls Heritage Site, located by coordinates of 10° 05'S, 30° 55'E and lying at an elevation of 1260m, covers 777 hectares[2]. The specific objective entailed to conduct an inventory of plants of ethnobotanical value in the Chishimba area. In order to answer the relevant research question, the method used by Bano *et al*., (10) which was based on qualitative and descriptive data to survey plants of ethnobotanical value, was adopted. This method involves systematically sampling data to access information from respondents of various ages, gender factors and experiences in folklore botany. Information on plant uses was collected through the application of the questionnaires administered to some residents of Chishimba Falls rural communities.

The study entailed the development of a systematic sampling procedure to access the information from varying ages, sex statuses and respondents known to be experienced in folklore botany. The questionnaires were administered to 81 informants. In other words, each household was represented by one family member. Six field assistants from Nandola and Kalonga villages were engaged to administer the questionnaires to the local people on useful indigenous plant species, particularly focussing on the edible and medicinal plants found in the study area where data was collected(10). Local names of plants were recorded in the Bemba language, and these were later linked to their respective scientific names by consulting the available literature (11, 12,13).

3.1. Ethical Considerations

The ethnobotanical data was collected during the period from March to August 2019. Permission to conduct research was sought from the Headmen of Kalonga and Nandola villages in the area of sub-Chief Mwamba in Kasama District. From a population of 2000 residents who are mostly subsistence farmers(14), the exercise involved 240 households to collect the data, particularly focussing on the edible and medicinal plants found in the study area. However, from this set of 240 households recorded in the villager register, only 81 households were drawn out (selected) as informants. In this regard, six field assistants from Nandola and Kalonga villages were engaged to help administer the questionnaires. The challenge experienced by working in the area was that the informants were reluctant to release information on how they administer traditional medicines. Such information could only be given by informants at extra costs to the researcher. A problem arising from such an arrangement where informants are paid could lead to the temptation of tagging non-authentic names of some plant species for monetary gains.

4.0. Results and Discussion

The overall study revealed that 314 plants had been recorded to occur at Chishimba Falls Heritage Site. These consist of 12 species of bryophytes, 18 species of pteridophytes and 284 species of seed plants[9]. These taxa were recorded from

such vegetation types as the riparian forests, the evergreen forest relicts, the Miombo woodland and the edaphic grassland. The evergreen forest relicts are locally known as the Mushitus. It must be stressed at this point that all the 314 species recorded at Chishimba Falls are significant to the ecology of the four main vegetation types prevalent in the study area. However, only 138 species of flowering plants of ethnobotanical value have been documented at Chishimba Falls and the surrounding area, as listed in Appendix 1.

It must be stressed that all plant species occurring in any given vegetation type are of ecological significance because they contribute to the horizontal and vertical structure of each vegetation type and that they also sustain the floristic composition of plant communities in these four vegetation types occurring in the study site. In this area, plants of ethnobotanical value are utilised as medicines, sources of food, beverage, timber and some are used as building materials. Among the 138 angiosperm species of ethnobotanical value, 91 species are medicinal plants, whereas 47 species are non-medicinal plants. As indicated earlier, this study focused on reviewing prospects for the domestication of one species of *Aloe,* namely; *Aloe mzimbana*, which has been recorded at the Chishimba Falls Heritage Site. However, it is a taxon of widespread distribution in high-rainfall areas of Zambia.

4.1. Prospects for the Domestication of *Aloe Mzimbana*

A diversity of flowering plants will differ in terms of their form and the chemical compounds they contain. Observations have been made to the effect that the ability of plants to produce carbohydrates and a diversity of other biological compounds makes plants far more useful natural resources to humans(15). In addition to being sources of food, fodder, building material and other natural products, and plants are considered vital sources of medicines. It has also been observed that traditional societies retain more knowledge about medicinal species compared to the more westernised societies(16). However, it has been noted that medicinal plants are widely used in traditional cultures in several parts of the world(17).

Authorities in ethnobotany have also noted that traditional healers may not understand the scientific rationale associated with their medicines but instead, rely on their personal experience to believe that plants they use are highly effective if applied at some level of therapeutic doses. On the other hand, scientists have established that bioactive compounds are contained in different parts of the plants, such as the leaves, bark of roots, fruits or seeds(17).

A description of some plant parts will help explain why traditional healers selectively exploit these parts as sources of medicine. The leaf is the main photosynthetic organ of plants that, in a majority of plants, usually consists of the petiole and leaf blade. The root is an underground plant organ that absorbs water and mineral nutrients from the soil. The stem is an organ of the plant that bears the leaves, flowers and, ultimately, the fruits. The bark is the outer protective layer of the tree trunk. The rhizome is an underground stem located below the soil surface and bears leaves projected above the soil surface and the bearing roots that develop and grow below the soil surface. The bulb is a fleshy underground organ

consisting of overlapping fleshy scale leaves found in onion plants. The fruit is a seed-bearing plant organ, which may be either fleshy, as noted in mangoes, or dry, as noted in beans(17).

It has been noted that in the field of phytomedicines or pharmaceuticals, plant-derived medicines contain chemical compounds that act on the human body to prevent physiological disorders and thus, contribute to the restoration or maintenance of people's health(17). One plant genus that evolved in the Old World and has contributed bioactive compounds of pharmaceutical value is *Aloe* L., a member of the monocot family Asphodelaceae. The genus *Aloe* consists of more than 600 species, including such taxonomic categories as subspecies and varieties and whose natural distribution encompasses Africa, the Arabian Peninsula, Socotra, Madagascar and the Mascarene Islands(18). Zambia is a natural home to 19 species of *Aloe*, of which one is *Aloe mzimbana* I. Verdc and Christian has been recorded at Chishimba Falls Heritage Site[19, 20].

Aloe vera (L.) Burm. f. is prominent as the basis of its traditional medicinal value and thus, stands out as being of great importance in the pharmaceutical industry globally. This means that most of the drug aloes of the world are produced from *Aloe vera*, a species which originates from North-east Africa and the Arabian Peninsula. The cultivation of *Aloe vera* in the West Indies, USA, China and East Africa has become a major pharmaceutical industry to such an extent that the aloe industry has been estimated to have a turnover of more than US$100 billion per annum (21,22). In South Africa, medicinal products are sourced from *Aloe ferox* Mill., a species widely distributed in the dry parts of the Western and Eastern Cape provinces, southern KwaZulu-Natal, with few localities recorded in southwestern Lesotho and the south-eastern part of the Free State (22).

Aloe ferox has become an important commercial medicinal plant for traditional use as a laxative and a source of raw materials for health drinks and cosmetics formulations. Van Wyk and Smith(22) have also reported that when a leaf of the *Aloe* plant is cut, it produces a bitter yellow juice that exudes from the outer green part of the leaf. This juice contains a laxative compound called aloin, which occurs in *Aloe ferox* and *Aloe vera*.

Aloin is also known as anthrone or barbaloin, a quinone compound which is a form of C-glucoside occurring in leaves of several *Aloe* species that are cultivated as sources of drugs. The chemical structure of quinones is such that they all contain the same basic chromophore (coloured part), which consists of two carbonyl groups(23). In addition to laxative activities, other properties of *Aloe ferox* products include aspects of anti-oxidants, anti-inflammatory, anti-cancer, anti-microbial and anthelmintic activities(21).

The anatomical middle part of leaves of *Aloe* species contains a non-bitter inner parenchyma gel. This aloe gel is a water-soluble polysaccharide known as glucomannan found in leaves of succulent plants and whose physiological role is to help retain water content in aloe leaves. As a health benefit attributed to most aloe plants, the action of glucomannan promotes the production of fibroblast, thus, increasing the amount of collagen synthesis – a process which enhances the process of wound-healing(22). In South Africa, the first commercial plantation of *Aloe ferox* was established in 1976 by Dr Tewis Muller near Albertinia in the Western Cape Province(21).

It follows then that the domestication of *Aloe ferox* and *Aloe vera* as sources of drugs is yet another window of opportunity that should prompt Zambia into the domestication of some *Aloe* species to supply raw material for the production of drugs. This study has revealed that among the 19 species of *Aloe* that are indigenous to Zambia(19,20), only *Aloe mzimbana* I. Verdc. and Christian has been recorded within the Chishimba Falls Heritage Site. The type locality of this species was first recorded in northern Malawi, 29km north-east of Mzimba, as per data attached on the specimen collected on 8 June 1938 by Pole Evans and Erens 643, and the holotype specimen of this species is held in the Pretoria herbarium (PRE)(24). The natural growth habit of *Aloe mzimbana,* as earlier captured in Luapula Province, is illustrated in Figure 1.

Aloe mzimbana is a perennial succulent plant that develops suckers to form dense communities on rock outcrops. The plant bears greyish-green leaves that are curved inwards and characterised by whitish spots fringed with pink margins on both the abaxial and adaxial surfaces. The inflorescence is erect, up to 60cm long and typified by bearing several bracts below each raceme(24).

Aloe mzimbana, a candidate that is hereby being groomed for domestication in Zambia, ecologically occurs on rock outcrops and is found in high-rainfall regions of Zambia. Its distribution range covers Central, Luapula, Muchinga, Northern and Northwestern(20). Recent fieldwork conducted by a research student, Emmanuel Kapongolo, has confirmed the occurrence of this species at the Chishimba Falls Heritage Site. Furthermore, herbarium records show that *Aloe mzimbana* has authentically been recorded in Kapiri Mposhi, Kasama, Kawambwa, Mbala, Mporokoso and the Nyika Plateau. The geographical range of this species extends into Congo DR, Malawi and Tanzania(19,25). Therefore, the region that is best suitable for the domestication and cultivation of *Aloe mzimbana* can be located in the northern part of Zambia, which receives high annual rainfall.

4.2. Considerations on Human Safety

The introduction of *Aloe mzimbana* into the agricultural system needs to consider other factors, such as the yield of raw materials with bioactive compounds and the verification of the probable occurrence of lethal toxic compounds reported in some species of *Aloe*. These considerations should be based on the commercial importance drawn from the cultivation of *Aloe ferox* in South Africa and *Aloe vera* in the West Indies. With regard to lethal compounds, studies conducted in East Africa reveal that some species of *Aloe* have been reported to contain poisonous compounds that are lethal to mammals. For instance, Newton (26) has reported three poisonous *Aloe* species in Kenya, namely: *Aloe ballyi* Reynolds, *Aloe elata* S. Carter and L.E. Newton and *Aloe ruspoliana* Baker.

The poisonous species of *Aloe* are reputed to contain a hemlock poison called **γ-coniceine** (gamma-coniceine), a highly toxic compound known to be teratogenic. The mechanism of this poison involves the disruption of the central nervous system, which leads to respiratory paralysis and death of the mammal. In addition, a teratogenic is an agent that can disturb the development of the mammalian embryo or foetus, thus, resulting in spontaneous abortion(23). It has been reported that in some parts of north-eastern Africa, *Aloe ruspoliana* is used for killing hyenas. In this case,

meat that has been smeared with the leaf exudase from this *Aloe* species is left lying around the villages at night, and hyenas are found to be dead the following morning(26). These findings necessitate the need to establish that *Aloe mzimbana*, proposed for domestication to join the pharmaceutical importance attained by *Aloe ferox* and *Aloe vera,* does not contain lethal compounds reported in some species of *Aloe* in East-Africa.

Figure 1: *Aloe mzimbana* on rock outcrop at Mumbuluma Falls north of Mansa (Photo by PSM Phiri)

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Appendix 1: Inventory of useful flowering plants of Chishimba Falls Heritage Site and the surrounding area. Local names are in Bemba or Lungu languages.

Botanical Name	Local Name	Use
MONOCOTYLEDONS		
ASPARAGACEAE		
Asparagus plumosus Baker	Kemyanshinge	medicine
ASPHODELACEAE		
Aloe mzimbana I. Verdc. & Christian	Chitembwisha	medicine
COLCHICACEAE		
Gloriosa superba L.	Mukolwe	medicine
COMMELINACEAE		
Floscopa polypleura Brenan	Chinkofwa	vegetable
CYPERACEAE		
Ascolepis capensis (Kunth) Ridl.	Namwansa	medicine
ORCHIDACEAE		
Brachycorythis buchananii (Schltr.) Rolfe	Nakatali	food
Brachycorythis friesii (Schltr.) Summerh.	Nakatali	food
Disa welwitschii Rchb.f.	Chikanda	food
Disperis reichenbachiana Welw. ex Rchb. f.	Chikanda	food
Habenaria holubii Rolfe	Chikanda	food
Habenaria praestans Rendle	Chikanda	food
Liparis nervosa (Thunb.) Lindl.	Chikanda	food
Microcoelia globulosa (Hochst.) L. Jónss	Chikanda	food
Platycoryne macroceras Summerh.	Kalobo	food
Satyrium amblyosaccos Schltr.	Matibula	food
Satyrium trinerve Lindl.	Matibula	food
POACEAE		
Hyparrhenia cymbaria (L.) Stapf	Kawundwe	building
Hyparrhenia filipendula (Hochst.) Stapf	Mpumpu	building
Hyparrhenia rufa (Nees) Stapf	Kasansa	building
Imperata cylindrica (L.) Raeusch.	Ibamba	medicine
Loudetia simplex (Nees) C.E. Hubb.	Lweo	building
Oxytenanthera abyssinica (A. Rich.) Munro	Lusengu	building

SMILACACEAE		
Smilax anceps Willd.	Nkololo	medicine
ZINGIBERACEAE		
Aframomum angustifolium (Sonn.) K. Schum.	Mutungulu	medicine
DICOTYLEDONS		
AMARANTHACEAE		
Amaranthus hybridus L.	Ibondwe	vegetable
ANACARDIACEAE		
Lannea discolor (Sond.) Engl.	Nakabumbu,	medicine
Rhus longipes Engl.	Namulalusha	medicine
ANISOPHYLLEACEAE		
Anisophyllea boehmii Engl.	Mufungo	food
ANNONACEAE		
Annona senegalensis Pers.	Mulolo	medicinal
Hexalobus monopetalus (A.Rich) Engl. & Diels	Mukundukubwile	food
Uvariastrum hexaloboides (R.E. Fr.) R.E. Fr.	Chisofu	food
Xylopia odoratissima Welw. ex Oliv.	Changwe	medicine
APIACEAE		
Diplolophium zambesianum Hiern	Mumfwemfwe	medicine
Steganotaenia araliacea Hochst.	Mutebitebi	medicine
APOCYNACEAE		
Diplorhynchus condylocarpon (Müll. Arg.) Pichon	Mwenge	medicine
Strophanthus welwitschii (Baill.) K. Schum.	Kapempewansha	medicine
Tabernaemontana pachysiphon Stapf	Chinimbwe	medicine
ASTERACEAE		
Bidens pilosa L.	Kasokopyo	vegetable
Inula glomerata Oliv. & Hiern	Chibalani	medicine
Helichrysum sp.	Kalungambeba	medicine
BIGNONIACEAE		
Kigelia africana (Lam.) Benth.	Mufungufungu	medicine
CELASTRACEAE		
Salacia bussei Loes.	Mumpo	medicine
Salacia rhodesiaca Blakelock	Mumpo	medicine

CHRYSOBALANACEAE		
Magnistipula butayei De Wild.	Mubwilili	medicine
Parinari curatellifolia Planch. ex Benth.	Mupundu	food
Parinari excelsa Sabine	Mupundu	food
CLUSIACEAE		
Garcinia huillensis Welw. ex Oliv.	Musongwa	food
Harungana madagascariensis Lam. ex Poir.	Katumbi	medicine
Psorospermum febrifugum Spach	Katumbi	medicine
COMBRETACEAE		
Combretum collinum Fresen	Mufuka	medicine
Combretum molle R. Br.	Mulama	medicine
Combretum psidioides Welw.	Motamfumu	medicine
Combretum zeyheri Sond.	Mufuka	medicine
Terminalia sericea Burch ex DC.	Namwinshi	medicine
CONNARACEAE		
Rourea orientalis Baill.	Kapululambushi	medicine
DIPTEROCARPACEAE		
Marquesia acuminata (Gilg) R.E. Fr.	Museshi	timber
Monotes africanus A.DC.	Chimpampa	medicine
EBENACEAE		
Diospyros batocana Hiern	Muntufita	medicine
EUPHORBIACEAE		
Antidesma venosum E. Mey ex Tul.	Mulambabwato	medicine
Hymenocardia acida Tul.	Kapempe	medicine
Maprounea africana Müll. Arg.	Kafulamume	medicine
Phyllanthus muellerianus (Kuntz) Exell	Mupetwalupe	medicine
Pseudolachnostylis maprouneifolia Pax	Musangati	medicine
Uapaca kirkiana Müll. Arg.	Musuku	food
Uapaca lyssopyrena Radcl.-Sm.	Musokolowe-wabuta	food
Uapaca pilosa Hutch.	Mupangwa	food
Uapaca robynsii De Wild.	Mupangwa	food
Uapaca sansibarica Pax	Musokolowe	food
FABACEAE		
Afzelia quanzensis Welw.	Mupapa	medicine
Albizia adianthifolia (Schumach.) W. Wight	Mutanga	medicine
Albizia antunesiana Harms	Musase	medicine
Brachystegia boehmii Taub.	Muombo	medicine

Brachystegia floribunda Benth.	Musompa	medicine
Brachystegia longifolia Benth.	Muombo	medicine
Brachystegia spiciformis Benth.	Muputu	medicine
Cassia abbreviata Oliv.	Munsokansoka	medicine
Dalbergia nitidula Baker	Kalongwe	medicine
Dichrostachys cinerea (L.) Wight & Arn	Katenge	medicine
Dolichos linearifolius Johnston	Chibombolwa	medicine
Dolichos trinervatus Baker	Chibombolwa	medicine
Droogmansia pteropus (Baker) De Wild.	Mulundenya	medicine
Eriosema shirense Baker f.	Mukusao-ukalamba	medicine
Erythrina abyssinica Lam. ex DC.	Kalunguti	medicine
Erythrophleum africanum (Welw. ex Benth.) Harms	Kayimbi	medicine
Indigofera rhynchocarpa Welw. ex Baker	Munkunka	medicine
Isoberlinia angolensis (Welw. ex Benth.) Hoyle & Brenan	Mutobo	medicine
Julbernardia globiflora (Benth.) Troupin	Mpasa	medicine
Mucuna pruriens (L.) DC.	Kaenya	medicine
Philenoptera bussei (Harms) Schrire	Chiya	medicine
Pterocarpus angolensis DC.	Mulombwa	timber
Pterocarpus tinctorius Welw.	Mukula	timber
Rhynchosia insignis (O.Hoffm) R.E. Fr.	Munkoyo	beverage
Swartzia madagascariensis Desv.	Ndale	medicine
Vigna nuda N.E. Br.	Muchilikandibu	medicine
GENTIANACEAE		
Anthocleista schweinfurthii Gilg	Mulwalwalwa	medicine
LAMIACEAE		
Ocimum americanum L.	Kafupa	medicine
Ocimum obovatum E. Mey ex Benth.	Kafupa	medicine
Vitex doniana Sweet	Mufutu	food
LORANTHACEAE		
Agelanthus nyasicus (Baker & Sprague) Polhill & Wiens	Mwikalampungu	medicine
MALVACEAE		
Azanza garckeana (F. Hoffm) Exell & Hillc.	Mukole	food
Dombeya rotundifolia (Hochst.) Planch.	Chinga	medicine
Hibiscus subdariffa Rottl.	Lumanda	vegetable
MELASTOMATACEAE		
Memecylon flavovirens Baker	Mufishameno	medicine

MELIACEAE		
Turraea nilotica Kotschy & Peyr.	Mulyansefu	medicine
MORACEAE		
Ficus barteri Sprague	Mukunyu	food
Ficus natalensis Hochst.	Mutaba	medicine
Ficus sansibarica Warb.	Mutombolya	food
Ficus stuhlmannii Warb.	Mupula-mpako	medicine
Ficus sur Forssk.	Mukunyu	medicine
MYRTACEAE		
Syzygium cordatum Hochst. ex C. Krauss	Mufinsa	food,
Syzygium guineense (Willd.) DC.	Musafwa	food,
Syzygium owariense (P. Beauv.) Benth.	Luamba	medicine
PASSIFLORACEAE		
Adenia lobata (Jacq.) Engl.	Mobole	medicine
PEDALIACEAE		
Sesamum angolense Welw.	Mukonde	medicine
POLYGALACEAE		
Polygala exelliana Troupin	Kanamwilila	medicine
Securidaca longipedunculata Fresen	Mupapi	medicine
PROTEACEAE		
Faurea saligna Harv.	Saninga	medicine
RANUNCULACEAE		
Clematis villosa DC.	Nyinu	medicine
RHAMNACEAE		
Ziziphus abyssinica A. Rich.	Kalangwa	medicine
RUBIACEAE		
Canthium lactescens Hiern	Mukolobondo	medicine
Fadogiella stigmatoloba (K. Schum.) Robyns	Musengele	medicine
Gardenia imperialis K. Schum.	Munamba	medicine
Psychotria eminiana (Kuntze) E.M.A.Petit	Chitapatapa	medicine
Psychotria kirkii Hiern	Namulilo	medicine
RUTACEAE		
Zanthoxylum chalybeum Engl.	Pupwe	vegetable

SALICACEAE		
Flacourtia indica (Burm.f.) Merr.	Mutumbwisha	food
SAPINDACEAE		
Haplocoelum foliolosum (Hiern) Bullock	Nachisungu	medicine
Zanha africana (Radlk.) Exell	Chibangalume	medicine
SAPOTACEAE		
Chrysophyllum bangweolense R.E. Fr.	Muyenga	medicine
Mimusops zeyheri Sond.	Mubungabunga	medicine
SOLANACEAE		
Withania somnifera (L.) Dunal	Mutuntula	medicine
STRYCHNACEAE		
Strychnos cocculoides Baker	Kasongole	food
Strychnos innocua Delile	Mulungi	food
Strychnos potatorum L.f.	Mubanga-chulu	medicine
Strychnos pungens Soler.	Mukome	food
Strychnos spinosa Lam.	Sansa	food
THYMELAEACEAE		
Craterosiphon quarrei Staner	Mukole	medicine
VITACEAE		
Cissus quadrangularis L.	Mobole	medicine