



Traditional Medicinal Plants in Two Urban Areas in Kenya (Thika and Nairobi): Diversity of traded species and conservation concerns

Grace N. Njoroge

Research

Abstract

In Kenya there is a paucity of data on diversity, level of demand and conservation concerns of commercialized traditional medicinal plant species. A market study was undertaken in two urban areas of Central Kenya to identify species considered to be particularly important in trade as well as those thought to be scarce. The most commonly traded species include: *Aloe secundiflora* Engl, *Urtica massaica* Mildbr., *Prunus africana* (Hook.f.) Kalkm, *Melia volkensii* Gürke and *Strychnos henningsii* Gilg. *Aloe secundiflora*, *P. africana* and *Strychnos henningsii* were found to be species in the markets but in short supply. The supply chain in this area also includes plant species already known to be rare such as *Carissa edulis* (Forssk.) Vahl and *Warburgia ugandensis* Sprague. Most of the suppliers are rural herbalists (who harvest from the wild), while only a small proportion of the raw materials come from domesticated species. Key challenges facing the herbal industry in the region were identified and presented.

Introduction

In 2010 the Convention on Biological Diversity (CBD) targeted to achieve significant reduction in the rate of biological loss. Unfortunately, there is a critical shortage of biological data essential for implementation of strategic conservation strategies in order to address objectives such as these. Such data are especially urgent for traditional medicinal plants previously utilized at the local community level but now gaining commercial status in urban areas. Studies show that people in developing countries depend on wild resources for meeting their livelihoods needs (Pimentel *et al.* 1997). The incomes obtained from such wild resources contribute to achievements of International Development Targets (IDTs) objectives, especially poverty reduction (Poole 2004).

The use and commercialization of Non-timber forest products which include medicinal plants has been found to be an important livelihood strategy in developing countries where rural people are economically vulnerable (Belcher & Schreckenberg 2007, Schackleton *et al.* 2009). This brings about improvement of incomes and living standards (Mbuvi & Boon 2008, Sunderland & Ndoye 2004). In the trade with *Prunus africana* (Hook.f.) Kalkm., for example, significant improvement of village revenues has been documented in some countries such as Madagascar (Cuningham *et al.* 1997). Plants used as medicines in traditional societies on the other hand, are still relevant as sources of natural medicines as well as raw materials for new drug discovery (Bussmann 2002, Flaster 1996, Fyhrquiet *et al.* 2002, Kisangau & Kokwaro 2004, Lange 1997, Lewis 2002, Marshall 1998, Natarajan & Iyer, 2000, Robbins 2000, Sofowora 1993, Voeks 1996, World Bank 2004). Harvesting of wild medicinal resources therefore is an economic activity recognized both locally and internationally (High & Shackleton 2000).

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It is unfortunate that in some cases motivation for short-term profits neglects consideration for sustainability (Hawkins 2008), leading to resource degradation, loss of selective medicinal plant populations, unstable economic enterprises and loss of livelihoods for those involved (Lewu *et al.* 2006, Schackleton *et al.* 2005). Consequently, it is being realised that the main constraints impeding the success of enterprises based on these biological resources is resource supply and sustainability (Ticktin 2004). Further, medicinal plant loss is expected to lower the quality of healthcare for the people who depend on them (Ngari *et al.* 2010).

Globally there is an increase in the number of countries regulating the sale of botanical drugs (ethnoherbals) with its value estimated at US\$ 60 billion per annum (Barnes *et al.* 2004). This global increase in demand for ethnoherbals is also attributed to dissatisfaction with conventional medicine in terms of effectiveness and/or safety. Further there is continued search for novel products from traditional medicinal plants (Makunga *et al.* 2008) particularly for development of effective new drugs that are non-toxic and inexpensive (Taylor *et al.* 2001).

In Kenya the number of studies based on screening traditional medicinal plants has increased drastically. This has led to formulation of improved botanical preparations from traditional medicinal plants which are stimulating commercialization of these products. Data from the Ministry of Gender, Sports, Culture and Social Services reveals that the number of traditional medical practitioners registering their commercial enterprises/herbal clinics (usually in the urban areas) is on the increase. Further, the number of patients being treated in these herbal clinics is on the increase, sometimes reaching well over 500 patients per month (Njoroge 2006).

Although Kenya's herbal industry is perceived to be growing, status of species involved on the urban markets has not been studied. There are indications however, to show that in some areas trade in medicinal plants may be based on a few well-known and preferred species used preferentially to manage most ailments (Barnett 2000, Maundu *et al.* 2006). Whereas such information is available for some regions no data exists for Central Kenya and particularly in the major urban areas. This region hosts some of the major trading points in the country especially Nairobi with the current population standing at about 3 million people.

As a follow up on an earlier comprehensive ethnobotanical study of medicinal plants used in the rural areas of Central Province of Kenya (Njoroge *et al.* 2004, Njoroge & Bussmann, 2006a, 2006b, 2006c, 2007) the current research was undertaken. Based on various indices, the current study aimed at revealing important medicinal plants in the rural and urban areas of this region. For commercialized species data was gathered regarding popular species in the trade, most difficult species to obtain/scarce species,

type of suppliers, origin of species, commercial species whose conservation status is of concern as well as challenges facing local for purposes of capacity building in future development of the industry.

Methodology

Data from an earlier ethnobotanical study in Central Province of Kenya was collated to reveal medicinal plants considered by the rural people as significant to them. This included species with multiple uses, high fidelity level and use frequency among respondents. Data regarding trade in traditional medicinal plants coming from Central Province of Kenya was collected in two urban areas: Nairobi city and Thika town (Figure 1). Nairobi is the capital city of Kenya and is found in the Central region of Kenya. It has now grown to become a metropolis with over 3 million people. Estimates show that Nairobi will become a megacity of 15 million by the year 2020. Thika town, on the other hand, is situated about 40 kms northeast of Nairobi and is an important market town in the Central Province of Kenya. The town is growing rapidly and is expected to join up with the city in formation of the metropolis.



Figure 1. Thika and Nairobi urban areas, Central Province of Kenya where research was undertaken.

Initial visits were undertaken in open air markets, herbal processing points and herbal clinics to establish possible key informants for this study. The identified group comprised herbalists in permanent selling or treatment points, processors who receive supplies from rural areas to make semi-processed products, wholesalers who supply retailers in the urban areas as well as middle men who supply

Njoroge - Traditional Medicinal Plants in Two Urban Areas in Kenya (Thika and Nairobi): Diversity of traded species and conservation concerns 331

Table 1. Plant families of 89 most frequently mentioned (cited 5 or more times) medicinal plant species indicated as important by rural communities in Central Province of Kenya.

| | | | | |
|---------------|----------------|----------------|-------------|--------------|
| Acanthaceae | Capparaceae | Euphorbiaceae | Mimosaceae | Rutaceae |
| Agavaceae | Caricaceae | Fabaceae | Moraceae | Sapindiaceae |
| Amaranthaceae | Chenopodiaceae | Flacourtiaceae | Myrsinaceae | Solanaceae |
| Anacardiaceae | Combretaceae | Hydnoraceae | Myrtaceae | Urticaceae |
| Apocynaceae | Convolvulaceae | Lamiaceae | Oleaceae | Verbenaceae |
| Asparagaceae | Crusulaceae | Lauraceae | Oliniaceae | Vitaceae |
| Asphodelaceae | Cucurbitaceae | Loganiaceae | Rhamnaceae | |
| Asteraceae | Cupressaceae | Malvaceae | Rosaceae | |
| Canellaceae | Ebenaceae | Meliaceae | Rubiaceae | |

these markets having obtained the products from farmers or rural communities. In the case where herbal clinics were run by people in other professions and therefore have hired not so knowledgeable personnel, telephone interviews were carried out with the business owners.

In total, 50 respondents were identified but only thirty one 31 consented to the interviews. After explaining the purpose of the study and obtaining oral prior informed consent, interviews were undertaken using semi-structured interview guides. Focused discussions were also undertaken. The aim was to receive information regarding popular species in the trade, most difficult species to obtain/scarce species, type of suppliers, origin of species, commercial species whose conservation status is of concern as well as challenges facing local entrepreneurs involved in the trade. The data obtained from the interview guides was supplemented by direct observations at the sale or treatment points. Information about importance of each species to the local communities as well as traders was analyzed for Fidelity level as: $FL = (I_p/I_u) \times 100$; where I_p is the number of informants who gave information of a given species as being important while I_u is the total number of all informants mentioning important medicinal plants (Al-Qura'n 2005).

Plants collected during the ethnobotanical study were identified using the Flora of Tropical East Africa family fascicles and other local taxonomic literature. Assistance in identification was sought from an experienced botanist (Mr. Simeon Mathenge) of the University of Nairobi herbarium. Identified specimens were then compared with species descriptions to ensure that there was agreement between the characters observed on the specimen and those provided by the descriptions of the plant it is presumed to be. Voucher specimens were collected in duplicates using standard taxonomic/ ethnobotanical procedures particularly recording important features for identification. Each specimen included vital parts such as leaves, stems, flowers and fruits where available. For every specimen collected the vernacular names were also recorded. Voucher specimens were deposited at the Jomo Kenyatta University of Agriculture and Technology Herbarium as an ethnobotanical reference collection.

Results and Discussion

Results on important medicinal plants in rural Central Kenya indicated that 89 plant species were the most frequently mentioned, usually cited five or more times in the survey. Of these, 60 species were mentioned at least 10 times while 43 species were cited at least 15 times. These species were found to belong to 42 families (Table 1), most of the species being found in Asteraceae, Solanaceae, Rutaceae and Rubiaceae.

On the basis of frequency of use the most important medicinal plant species (28) were found to be those with a frequency of at least 19 times (Figure 2). From these data therefore, it is revealed that on basis of the number of respondents using the various species, eight (top eight in Figure 2) were reported more frequently. Other studies have shown some of these eight species are threatened (e.g., *Carissa edulis* (Forssk.) Vahl.) (Maundu *et al.* 2006, Njoroge & Bussman 2007). However, a species of lesser frequency (e.g., *Synadenium compactum* N.E.Br) is already cited as a rare species in appendix II of CITES. There were some species that were found to be infrequently used but were used with great consistency. These included: *Datura stramonium* L. used for management of pains (externally/topically applied), *Trimeria grandifolia* (Hocst.) Warb. used for management of peptic ulcers, and *Vangueria madagascariensis* J.F. Gmel. used management of postpartum weakness.

In regard to fidelity levels, among the 28 most frequently utilized species, this study established that the top nine have greater fidelity levels above 30 (Figure 3). While as some species have high frequency of citation, some appear to have low fidelity levels. However, *Aloe secundiflora* Engl. and *Senna didymobotrya* (Fresen.) H.S. Irwin & Barneby have both high frequency and fidelity levels and can be considered the most important medicinal species in the region.

This study revealed that 20 species are used each for management of at least 10 diseases/medical conditions (Figure 4). The top ten of these were used most often (Figure 4). These results indicate that *A. secundiflora* and *S. didymobotrya* are not only the most frequently utilized

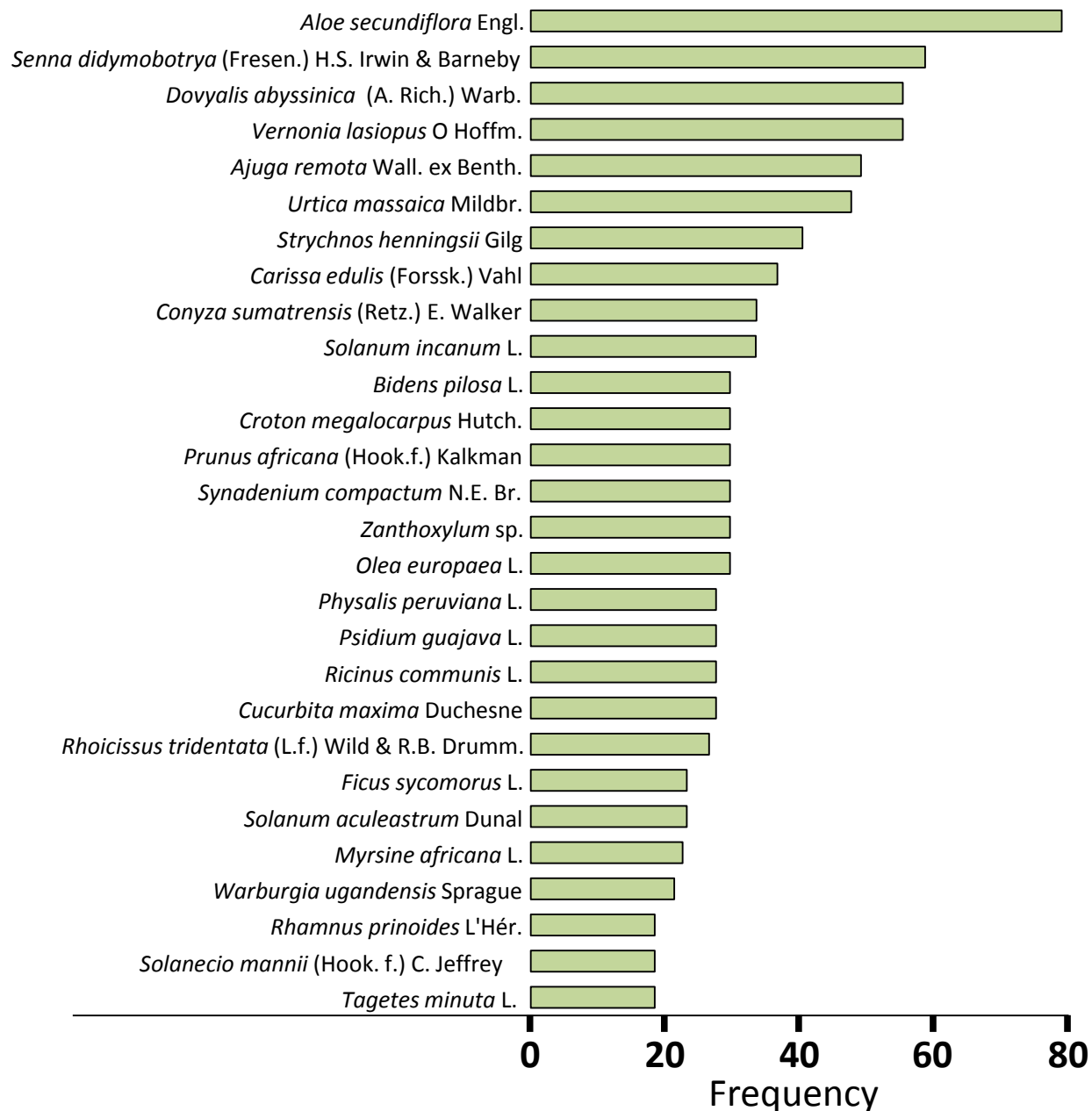


Figure 2. Medicinal plant species with highest frequency of use among rural users in Central Province of Kenya.

species, (based on high fidelity levels), but are also the ones managing most ailments. Hence these two are the most important medicinal plant species for the rural users. These plants therefore need assessment to establish levels of sustainable harvest from the wild.

There were plants however that were reported to be used for very few diseases sometimes even only one disease but can be considered important on basis of consistency of use, (i.e., 100% consensus among the respondents). An example of these is *Euphorbia joyae* P.R.O. Bally & S.

Carter that was being consistently used for management of postpartum hemorrhage.

Results from the market survey on the types of traders involved in the herbal industry revealed that most traders (50%) have established clinics used for treatment of patients as well as dispensing herbal remedies (Figure 5). This category of traders as well as retailers (vendors) of herbal products (40%) comprises the most popular forms of commercial herbal traders in this study area.

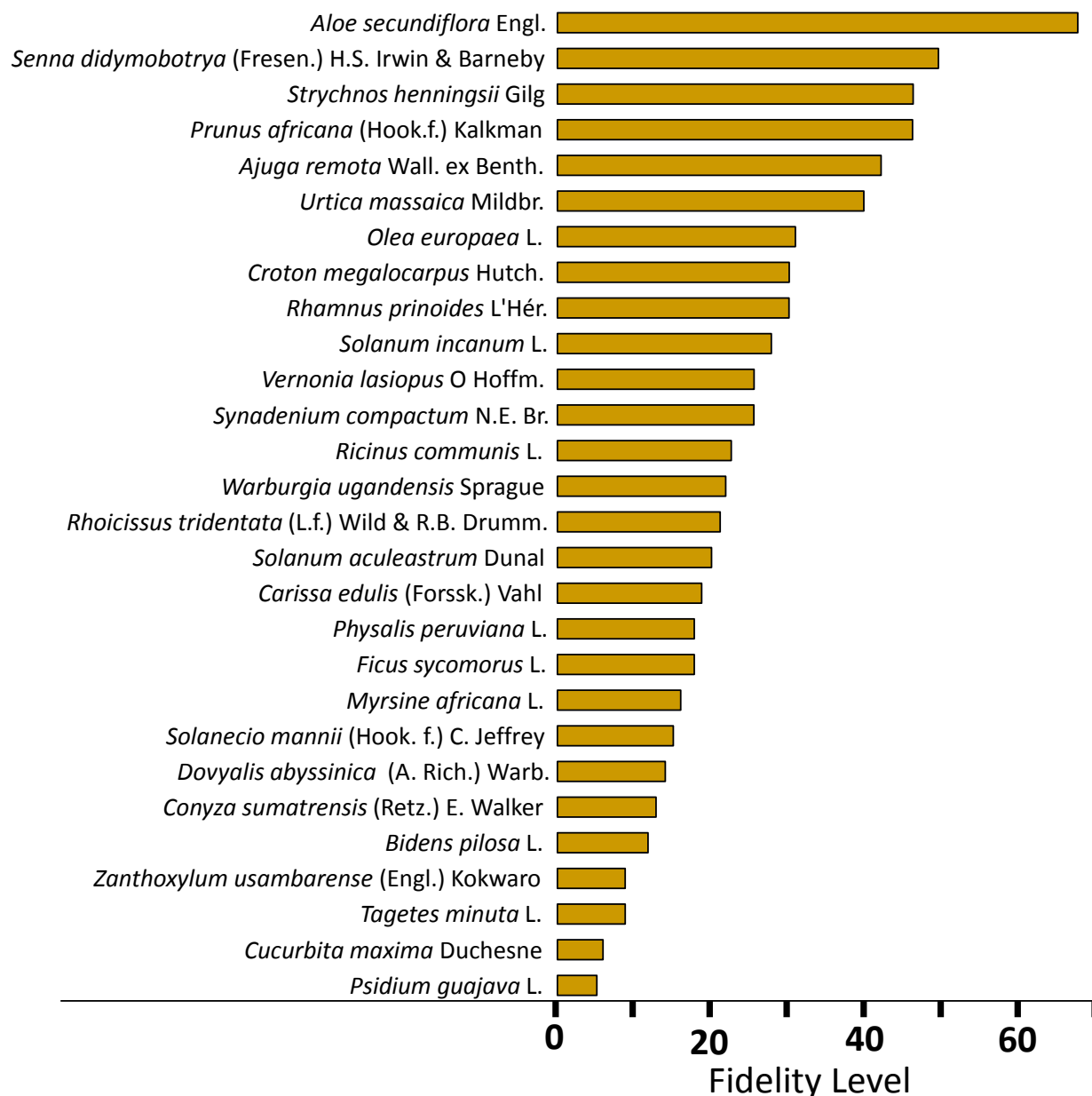


Figure 3. Fidelity levels of traditional medicinal plants used in rural areas of Central Province of Kenya. Fidelity level is: $FL = (I_p/I_u) \times 100$; where I_p is the number of informants who gave information of a given species as being important while I_u is the total number of all informants mentioning important medicinal plants.

Data on sources of supply for this trade indicate rural herbalists comprise the largest category of suppliers (39%) of herbal raw materials in the study area (Figure 6). This study also reveals that a number of traders obtain their supplies from urban processors (11%) or do their own collection of materials (24%) in the rural wild areas usually from the forests. Some of the supply however, is obtained from farmers (18%) who have already domesticated the required species. This could be the case for *P. africana* whose conservation status has been well documented and campaigns for its domestication well popularized in the recent past.

Data obtained from the traders indicate that there are about 8 species that are most traded in this region (Figure 7). Of these the most popular species included: *A. secundiflora*, *Urtica massaica* Mildbr., *P. africana*, *Melia volkensii* Gürke and *Strychnos henningsii* Gilg. These are the species that most traders make most income from as they are most frequently requested by the consumers. They therefore form what is referred to as bread-and-butter commodities (Williams *et al.* 2000) of this trade in this region. Of major concern is *A. secundiflora* that has extremely high demand in the rural areas as well as in commercial enterprises, yet the resources are obtained

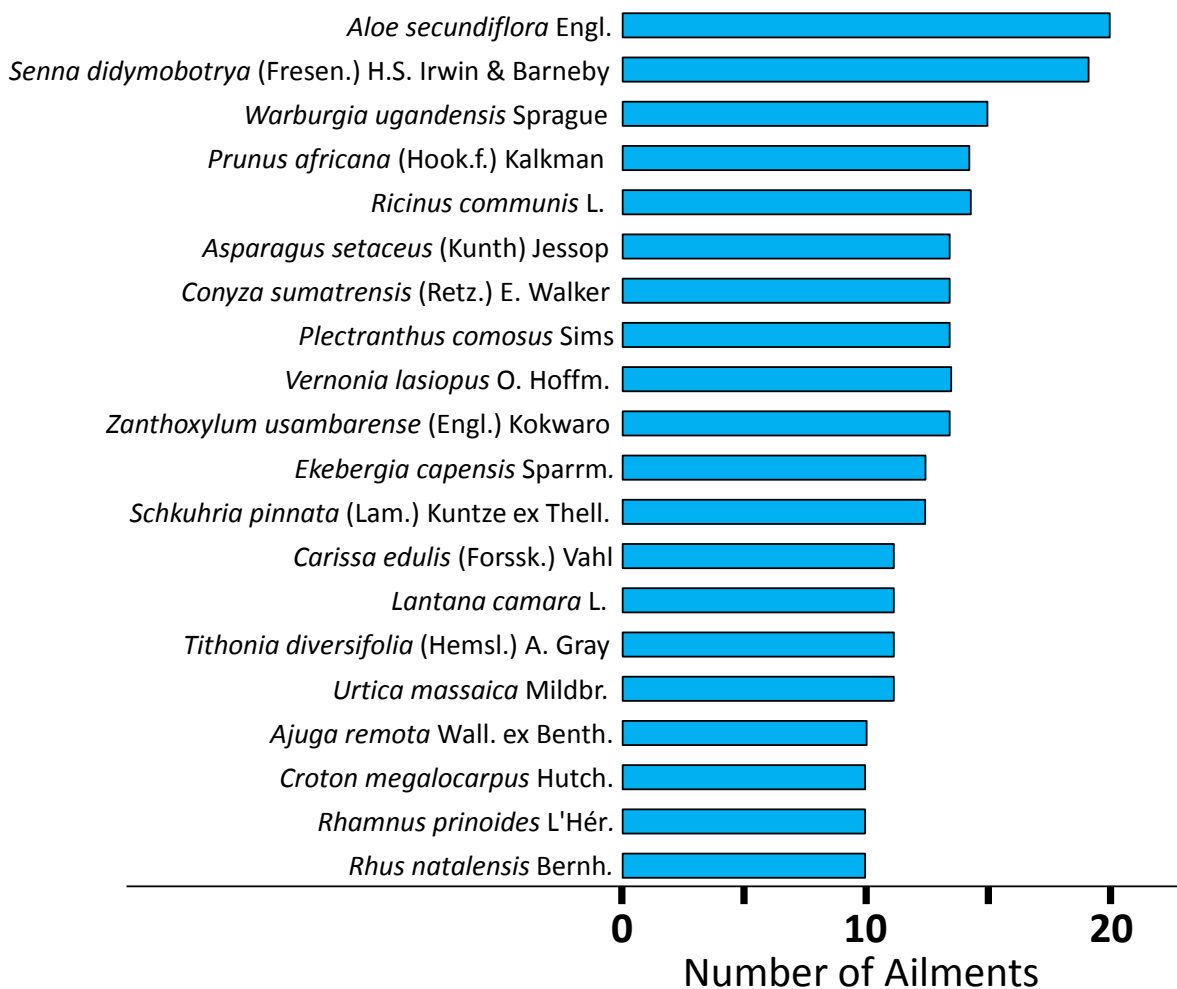


Figure 4. Important medicinal species of Central Province of Kenya based on number of diseases index (number of uses per species).

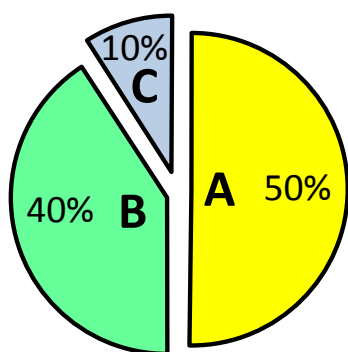


Figure 5. Types of traders dealing with herbal products in urban areas of Thika and Nairobi, Kenya: **A)** Clinics for treating and dispensing; **B)** Retail vendors; and **C)** Wholesale vendors.

from the wild. Those species that are in high demand in the urban market and not regarded to be of high medicinal significance by the rural communities are also of great conservation concern. Local people will usually conserve

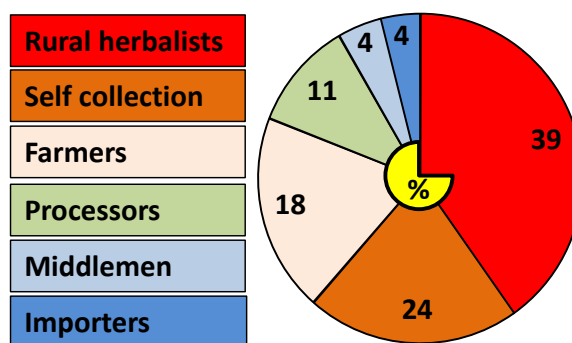


Figure 6. Types of suppliers for herbal materials traded in urban areas of Thika and Nairobi, Kenya.

those species that are culturally and economically important to them (Almquist *et al.* 1993).

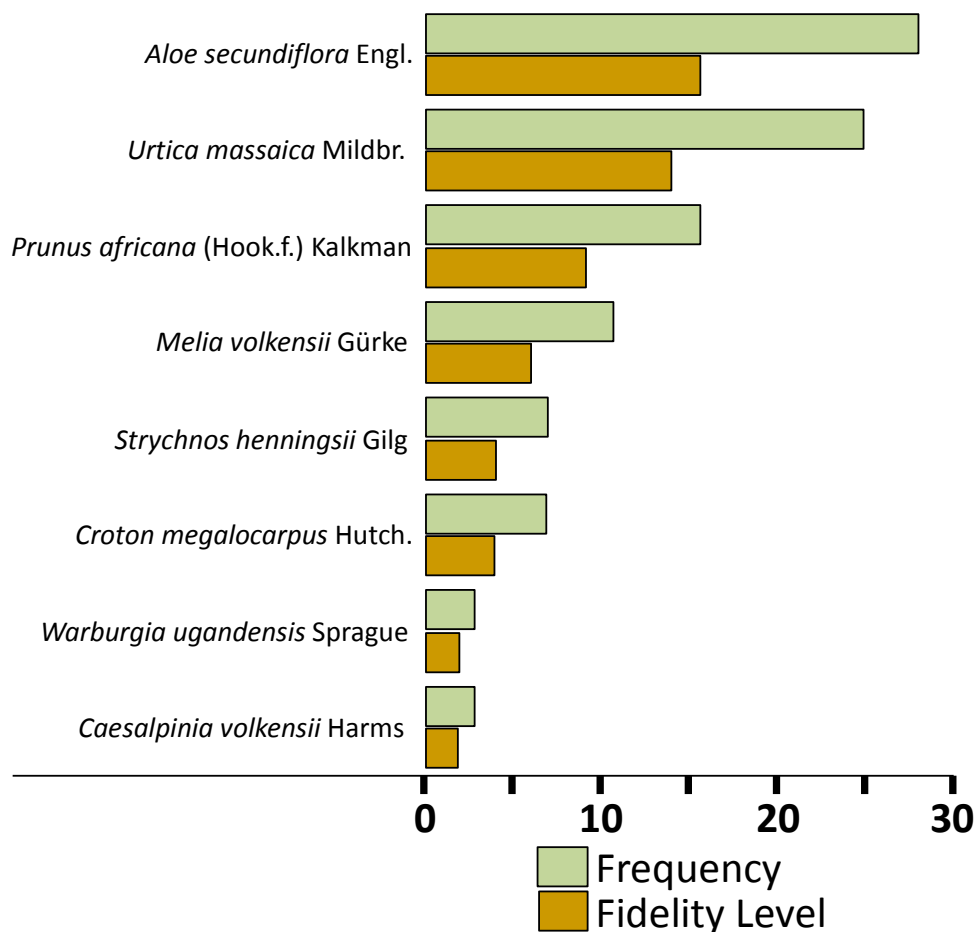


Figure 7. Frequency of use and fidelity levels of medicinal plant species reported to be in high demand in urban areas of Thika and Nairobi, Central Province of Kenya.

Results from this study indicate that there are three species important for this market that are in short supply (Figure 8). These plants were reported as relatively unavailable and hence scarce. Although figures involved in export trade are difficult to obtain, regular diary reports indicate that illegal trade in Aloes may still be on-going. The scarcity experienced by local traders therefore could be part of the competition arising from such activities. Although *P. africana* has been popularized in Kenya as an important species of domestication, the demand seems to exceed the supply. *Strychnos henningsii* is a popular flavoring agent for a traditional soup (**thubu, kikuyu**). This special soup has become a delicacy in the urban hotel industry likely leading to the scarcity experienced among local medicinal traders. These results agree with others elsewhere in that wild collection of commercial medicinal plants exerts pressure on species and may lead to unsustainable supplies (Hamilton 2003, Hawkins 2008). In the Rift Valley (Kenya), a recent study shows that some medicinal plants in the Njoro river watershed are threatened with local extinctions (Ngari *et al.* 2010). Conservation and do-

converted into agricultural lands with minimal domestication strategies of useful wild plants.

- Climate change.

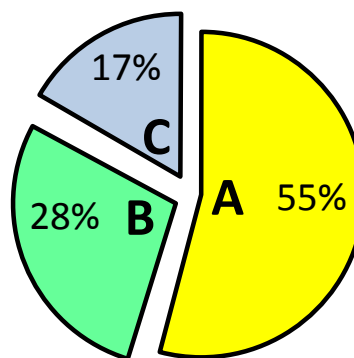


Figure 8. Commercial medicinal plant species in short supply in the urban areas of Thika and Nairobi, Kenya: **A)** *Aloe secundiflora* Engl.; **B)** *Prunus africana* (Hook.f.) Kalkman; and **C)** *Strychnos henningsii* Gilg.

mestication of medicinal plants in local utilization therefore is an urgent need.

These results therefore indicate that obtaining sufficient supplies for the herbal commercial enterprises for this region is a major challenge. The causes of these insufficient supplies were reported as:

- The only available supply is in some remote and inaccessible wild habitats, for example some inaccessible parts of mount Kenya.
- Over-exploitation of medicinal plants for other commercial purposes such as charcoal burning that offers a faster return than medicinal plants.
- Deforestation as wild habitats are continually being

Other key challenges reported by the herbal traders in this area include:

- People are now preferring packaged products but some traders lack capacity to do so.
- There are very few people who know the plant names (parataxonomists) that need to be harvested so the traders sometimes have to leave the business premises to themselves obtain raw materials.
- Some of the species have become very expensive, especially those that are hard to obtain.
- Lack of capital to expand or pay for the processing.
- Increasing imports that are considered as unfair competition.
- Transportation to remote areas due to poor infrastructure.
- Part of the local populations still holds herbalists with suspicion, erroneously perceiving them as "witchdoctors."
- Equipment and knowledge for processing and packaging often unavailable.

Conclusion

The results of this study show that there is demand for medicinal plants in both rural and urban areas of Central Province of Kenya. Although trade in these plants is growing in urban areas, supply shortages are already being experienced. In promotion of agroforestry and replanting programs in the country the medicinal plants with high frequency of use, high fidelity levels and required for the trade in the urban areas need to be considered as priority species. Areas to be considered for capacity building among local people involved in this trade include: parataxonomy (plant collectors) to identify species correctly, processing skills, and infrastructure development for areas hosting important species. Studies on the ecological status/population health of the popular species as well as investigation of the impact of imported herbal products on trade in local medicinal species.

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