

Full Length Research Paper

A review of edible orchids in Malawi

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Orchids are mostly known for their beautiful flowers, and food-flavoring products which make them a resource of great economic importance in the global horticultural and food industries. But in the Southern African region, orchids are particularly important for their tubers which are used for food, and are therefore traded within and across the countries. A number of researchers have reported a dramatic rise in the demand for these orchids in Zambia, which has forced traders to seek the tubers from outside the country. This has raised concerns about their sustainability as high exploitation pressure threatens the future existence of these wild edible orchids. Based on information from literature and from reconnaissance, ethnobotanical and social economic surveys that were undertaken in Mzimba and Kasungu districts, this paper reviews and examines these developments, with a focus on Malawi. The review highlights some of the areas that require more attention in terms of research and policy interventions, namely identification of all edible orchids, domestication of edible orchids, and trade controls.

Key words: *Disa*, domestication, edible orchids, *Habenaria*, Malawi, *Satyrium*.

INTRODUCTION

Orchids are mostly known for their beautiful flowers which make them a resource of great economic importance in the global horticultural industry. The attractive colour and shape of their flowers has made them very popular and as a result, these plants have great ornamental value, in the Southern African region particularly in Tanzania, Zambia, and Malawi orchids are mostly important for their tubers which are used as a source of food, and are therefore traded within and across the countries. The tubers are collected from the wild and processed into a meatless sausage locally called *chinaka*, *chikande* and *kikande* which is consumed as relish or just as a snack. The tubers are also reported to be used in the preparation of soup which is said to be served on the buffet tables and found on menus of some international tourist hotels (Hamisy, 2007).

Orchids grow most abundantly in tropical and subtropical forests, where they are largely epiphytic. Orchids belong to the family Orchidaceae. In Malawi, the genera to which species of edible orchids belong include *Habenaria*, *Satyrium* and *Disa*. These are all terrestrial orchids bearing underground tubers. Botanists believe that

the family Orchidaceae contains the largest number of species than any other family of flowering plants, with possibly as many as 25,000 species (Pillon and Chase, 2006; Chase, 2005; Chase et al., 2003).

Early studies on orchids in Southern Africa concentrated on taxonomic aspects (for example, La Croix et al., 1991; Linder and Kurzweil, 1999; Ruffo et al., 1996; Stewart et al., 1982; Williamson, 1977). But of recent, a number of researchers (Hamisy, 2007; Davenport and Ndangalasi, 2003; Bingham and Smith, 2002; Bingham and Kokwe, 2001; Golding, 2001; Ng'uni et al., 2001), have focused on the dramatic rise in demand for edible orchids which has led to an increase in cross-boarder trade thereby raising concerns about its sustainability as high exploitation pressure threaten its future existence. Focusing on Malawi, this paper reviews and examines these developments based on information from some of the work that has been done on edible orchids in the country, and from reconnaissance, ethnobotanical and social economic surveys that we undertook in Mzimba and Kasungu districts from 2004 to 2006. The review highlights the areas that require more attention in terms of research and policy interventions.

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EDIBLE ORCHIDS OF MALAWI

Early studies on orchids in Malawi can be traced back to

the work of Morris (1970), who studied and provided numerous drawings of epiphytic orchids. More than a decade later Morris (1982) and La Croix et al. (1983) expanded on the epiphytic orchids of Malawi with descriptions of other new species. But it is La Croix et al. (1991) who probably undertook the most comprehensive work on orchids in Malawi by describing 58 genera and identifying over 400 species. Each species was described in terms of its appearance, habitat, flowering time, and distribution within Malawi and in other countries. The descriptions were supported by distribution maps, about 280 line drawings of the orchids and about 120 colour photographs.

Recent works on orchids include that of the National Herbarium and Botanic Gardens of Malawi (NHBGM). The NHBGM is involved in systematic collections of the representatives of the major plant families, and the vegetation types of Malawi including indigenous plant species of both economic and medicinal value such as orchids. For example Zomba Botanic Garden is involved in the propagation and conservation of epiphytic orchids in wood charcoal and dead wood under shed. In addition some terrestrial orchid species were introduced to the Garden, among which are edible orchids such as *Disa* spp., *Habenaria walleri*, and *Satyrium* spp. Furthermore, over ten terrestrial orchids grow naturally in Mzuzu Botanic Garden, among which are also edible orchids such as *Disa* sp., and *Satyrium buchananii* (Nkoloma, 2001). The NHBGM also carried out some limited ethnobotanical studies of edible orchids focusing on propagation methods (Phingo News, 2003). Other efforts include that of the Millennium Seed Bank Project (Pungulani, 2006) aimed at conserving edible orchids in Malawi through integration of *in situ* and *ex situ* conservation strategies. Under this project, a special expedition was made to collect edible orchids. The expedition covered three districts in Malawi namely: Neno, Kasungu and Mzimba. A total of 9 accessions were collected. All the 9 accessions were phenotypically different, meaning that there is variation within the edible orchids in Malawi (Pungulani, 2006). Much of this section uses information from these works and studies.

In Malawi, edible orchids belong to genera *Disa* (The word *Disa* derives from a native South African language and means "Flower of the Gods" (Baumann, 2005), *Habenaria*, and *Satyrium* (Pungulani, 2006). *Disa* is a large genus centered in South Africa, with 121 species recognized and with 22 known from Malawi. All are terrestrial or occasionally lithophytic plants with round or cylindrical tubers, one dying back each year and a new one being formed for the following season's growth. The most distinctive feature of the genus is that the spur is formed from the dorsal sepal, other than the lip (La Croix et al., 1991). The attractive part of this genus is the large, brightly coloured sepals. Most members of the genus are found in boggy areas of montane grasslands (Baumann, 2005). Of the 22 species known from Malawi, we only

identified 3 edible species, namely *D. engleriana*, *D. robusta* and *D. zombica*. We suspect that there are more edible species under this genus.

As described by La Croix et al. (1991), *D. engleriana* has sterile shoots with two linear leaves, flushed with purple and heavily blotched at the base. This species is said to be quite widespread in Northern Malawi (Table 1), sometimes occurring as scattered plants, sometimes forming small colonies in which only a few of the plants flower in any one year. *D. robusta* has also sterile shoots with red-blotched basal sheaths and lanceolate, conduplicate leaves. It must have been more widespread in the past as one of the syntypes is a Buchanan collection from near Blantyre where the species has not been seen for a long time. Fortunately it is still common in the North of Malawi. *D. zombica* has sterile shoots with linear elliptical leaves which are red-spotted at the base. Sepals are magenta-purple at base, shading to green or sometimes all green. In any colony, the amount of green in the flowers seems to vary considerably as does the size of the bracts.

Habenaria is the largest orchid genus in Malawi with over 80 species. They comprise almost a fifth of all Malawi orchids and include some of the most spectacular species as well as many of the most dismal. *Habenaria* are easily recognizable and are rarely confused with other genera. In *Habenaria* the petals may be entire but are often bilobed; the lip also may be entire but usually trilobed and always spurred, the spur often being swollen towards the apex. The column bears two stigmatic processes, sometimes considerably elongated, with the receptive surface at the tips. The anthers are drawn out into anther canals which lie along the side lobes of the rostellum (La Croix et al., 1991). *Habenaria* are mostly found in montane grassland or dambo areas and are in abundance in February and March. The flower colours range between green and white (Baumann, 2005). In spite of its diversity, only one edible species namely *H. clavata* was identified from this genus during the reconnaissance survey. This plant has its 2 lowest leaves sheathing, while the upper 2 or 3 grading into bracts, and the rest ovate, clasping the stem at the base (La Croix et al., 1991).

Unlike most orchids, the flower of *Satyrium* is not twisted around 180°, meaning that the lip is on the upper part of the flower and not on the lower part. What may look like a normal lip are side sepals and petals pointing sometimes forward. *Satyrium* is recognized by the two spurs arising from the lip (Baumann, 2005). A total of 28 species were identified in Malawi (La Croix et al., 1991). From the 28 species, we identified only 3 edible orchids namely: *S. ambylosacco*, *S. buchananii*, and *S. carsonii*. As described by La Croix et al. (1991), *S. ambylosaccos* has well-spaced out leaves, with the lowest sheathing and the top-most bract-like, while the middle ones ovate-lanceolate loosely clasping the stem. It bears white flowers while all other parts are tipped green.

Table 1. Description of selected edible orchids of Malawi.

Species name	Habitat	Flowering time	Distribution in Malawi	Distribution Elsewhere
<i>Disa englerian</i>	Fairly open woodland (7280 - 1700 m)	February - April	Chitipa, Nyika National Park, Mzimba, Mzuzu, Nkhatabay.	D R Congo, Tanzania, Zambia.
<i>Disa robusta</i>	Montane grassland (1500 - 2000 m)	November - January	Chitipa, Nyika National Park, Dedza, Zomba.	D R Congo, Tanzania and Zambia.
<i>Disa zombica</i>	Montane grassland (1300 - 2350 m)	January - April	Nyika National Park, Mzimba, Mzuzu, Zomba.	Burundi, Tanzania, Zambia, Mosambique, Zimbabwe.
<i>Hebenaria clavata</i>	Brachystegia woodland or montane grassland (1100 - 2285 m)	February - April	Nyika National Park, Mzimba, Mzuzu, Blantyre.	South Africa.
<i>Satyrium ambylosaccos</i>	Montane grassland (1300 - 2250 m)	January - March	Chitipa, Nyika National Park, Mzimba, Mzuzu.	Tanzania, Zambia.
<i>Satyrium buchananii</i>	Wet montane grasslands (700 - 2400m)	December - January	Nyika National Park, Mzimba, Mzuzu, Nkhotakota, Kasungu, Lilongwe, Dedza, Zomba.	D R Congo, Tanzania, Zambia, Zimbabwe, Angola.
<i>Satyrium cursonii</i>	Brachystegia woodland (1300 - 1750 m)	January - February	Chitipa, Rumphu, Mzuzu, Mzimba.	Nigeria, Cameroon, D R Congo, Uganda, Kenya, Tanzania and Zambia.

Source: Compiled from La Croix et al., (1991).

S. buchananii is remarkable because it has relatively large pure white flowers and pending narrow linear spurs. The plant has sterile shoot with foliage leaves and a flower shoot with sheathing bract-like leaves. The lip forms a hood which bends back at the tip. The petals and sepals point forward and downwards (Baumann, 2005). *S. carsonii* has two leaves addressed to the ground; more or less orbicular, glabrous and light green, while the other leaves are slightly longer and narrower. It also bears white flowers (La Croix, 1991).

Table 1 describes some of the identified edible orchids in Malawi in terms of their habitat, flowering time, and distribution in the country and elsewhere. The table shows that *D. engleriana*, *S. ambylosacco* and *S. carsonii* have limited distribution within Malawi because they mostly occur in the northern region of the country. On the other hand *D. engleriana*, *D. robusta* and *H. clavata* have limited distribution within Africa because they do not seem to occur in more than three countries. Thus, *D. engleriana* and *S. ambylosacco* have limited distribution both in Malawi and within Africa.

METHODOLOGY

In order to establish the status and utilization of selected edible orchids in various ecosystems in Malawi, we reviewed relevant literature and undertook reconnaissance, ethnobotanical, and social economics surveys in the two target districts of Kasungu and Mzimba. The reconnaissance survey was conducted in order to

establish the occurrence, distribution and utilization of edible orchids by local communities so as to identify the most appropriate villages to target for the other in-depth studies. The ethnobotanical survey was undertaken as a rapid appraisal to establish the biodiversity of edible orchids, their eco-geographical distribution and regeneration potential. The social economic survey was undertaken to determine the contribution of edible orchids to household income and food security in relation to gender.

Reconnaissance survey

A comprehensive reconnaissance survey was done in Mzimba district while in Kasungu the researchers used key informants to identify potential study sites and villages. The survey approach consisted of three distinct phases:

- (i) seeking authority to conduct the survey in designated areas
- (ii) consultations and discussions with the main stakeholders and
- (iii) field visits to the localities where orchids were known to exist, and meeting local communities.

Consultations and discussions with official stakeholders occurred in their respective offices. However, consultations and discussions with communities occurred in the field where orchids were known to occur. The primary aim of these discussions was to collect information that would be used to select sites and villages where detailed studies would be conducted. In selecting the sites the researchers were guided by the following criteria; the villages to be selected should be the ones that are easily accessible with the surrounding forest, woodland or grassland likely to have at least two edible orchid species and the sites needed to have been subjected to some disturbances through harvesting of orchids and or trees.

Visits were made to sites that had been short listed from consultations and discussions using the above discriminatory criteria. At each site information was collected concerning biophysical and social data, names and abundance of orchids reported, current marketing practices and potential key informants/local collaborators in the respective sites. Purposive sampling technique was used to select potential sites that were visited by the researchers. Sampling continued until a saturation point was reached where there was no longer extra value from information obtained from more informants. All data and information collected were qualitative in nature and simple ranking of sites that met the criteria was used to select sites for further detailed studies.

Ethnobotanical survey

The ethnobotanical surveys in the two districts were conducted using a three-prolonged approach that focused on preparatory studies followed by questionnaire administration and culminated into post-field activities.

Results from the reconnaissance survey were used to define the sampling frame in each district. The researchers targeted and selected areas where several species of orchids were known to occur. In Mzimba District 8 villages covering 2 Traditional Authorities of Mzikubola and Mbelwa were selected, while in Kasungu 10 villages spreading across Traditional Authorities Kapelula, Wimbe, Kaomba, Mphomwa, and Chulu constituted the sampling frame. Local collaborators were identified in each of the two districts and these were responsible for making appointments and other arrangements for conducting the survey.

The questionnaires were administered through key informant interviews and focus group discussions. A purposive sampling scheme was adopted and only those people who were known in the villages to have indigenous technical knowledge in orchids or were directly involved in edible orchid harvesting, preparation, marketing and consumption were targeted. Sample size was not defined in advance but sampling continued until a point of information saturation was reached whence sampling was terminated. This phase of the survey was carried out after a pre-testing process and at a time when the orchids were in season.

Post-field activities included data entry, data cleaning, data validation, and data analysis. Data entry and cleaning was done using Microsoft Office Access 2003 while data analysis was done using SPSS.

Social economic survey

Results from the reconnaissance and ethnobotanical surveys were used in identifying target villages in Kasungu and Mzimba districts and in defining the sampling frame in each district. Six villages were selected. The selected villages were Mazwana, in Traditional Authority Mzikubola in Mzimba district, Chimphanga, and Chirwa in Traditional authority Kapelula in Kasungu district, and Kabzanga, Mndoliro, and Joveni, in Traditional Authority Wimbe again in Kasungu district.

Data collection was through a household survey, which was carried out in the month of August. August falls within the off-peak period for most farming activities in Malawi and as such it was expected that this would ensure full participation of villagers in the survey. In addition, this is also one of the months that orchids were recorded to be prevalent. A pre-tested questionnaire was administered to all households in the selected villages. The questionnaire collected information on household's profile, and on how orchids are collected, utilised and conserved in their natural habitat. This helped in establishing the contribution of orchids to people's livelihood; gender roles in orchid collection, processing and marketing; local eco-geographical knowledge of orchids' distribution;

and practices undertaken for orchids conservation. SPSS software was used to analyse the data.

RESULTS

Based on information from literature and from consultations with forestry professionals eight potential orchid sites were identified, four of which were visited during the reconnaissance survey. The four sites were chosen because of their high diversity of orchid's species, high production and processing of chinaka and well established chinaka markets. No sites were visited in Kasungu District. However, five potential orchid growing sites were identified through consultation with district forestry professionals.

During the ethnobotanical survey, 30 individuals were interviewed in Mzimba District, while in Kasungu a total of 117 people were interviewed either in groups or as individuals. In both districts over two thirds of the people sampled were women and their age ranged from 30 years to 60 years. In both cases, the interviewees were from a subsistence farming background and had at least a primary school-level education.

A total of 74 households were interviewed during the household survey. Female respondents represented 77% of the total sample. Only about 15% of the respondents had secondary education, but none had tertiary education while the rest had either primary education (57%) or no education at all. All the households interviewed were involved in farming and mostly grew maize for food and tobacco for sale. They also owned livestock and/or poultry. Their income was supplemented mainly through the sale of foodstuff, vending and piece work. About 91% of the households interviewed were involved in orchid collection.

Orchid collection and processing is mostly done by women and girls. From the social economic survey results, no men or boys were reported to be involved in this activity. The women and girls mostly went to collect the orchids in groups and rarely went alone. Elderly women were reported to have expert knowledge in identifying orchids' species and where they occurred. The most preferred species collected was *Satyrium cursonii* which was collected from dambos, forest reserves and game reserves. Collection started mostly in March and ended around July for Kasungu but extended to around November and December for Mzimba District.

Information collected from the reconnaissance, ethnobotanical and social economic surveys helped us to establish the conservation status of edible orchids and its utilization.

Status of edible orchids

We look at the status of orchids in terms of species diversity, eco-distribution, regeneration potential and indigenous conservation and management practices.

Species diversity and eco-distribution: Edible orchids are locally called chinaka. They are further classified into male and female chinaka. Six key names of edible orchids were

recorded in Mzimba District while as in Kasungu nine key names were recorded. From the names recorded, a total of six species of edible orchids were identified namely *Satyrium cursonii*, *Disa zombica*, *Satyrium buchananii*, *Satyrium ambylosaccos*, *Disa engleriana*, and *Disa* sp. The diversity varied from one locality to another. Only one village (Mazwana) in Mzimba District registered all the six edible orchid species.

In both districts edible orchids grow predominantly in dambos and upland areas. For instance, *S. buchananii* and *Disa engleriana* grow in upland areas, *S. ambylosaccos*, grows in dambo areas while *S. cursonii* and *D. zombica* seem to grow in both upland and dambo areas.

In this study, no species of edible orchids was reported to have become extinct. However, it revealed that some species such as *S. cursonii*, *S. buchananii*, *S. ambylosaccos* and *D. engleriana* are becoming scarce while their consumption is increasing. Observations and discussions with people revealed numerous threats to the occurrence of edible orchids. Some of the important factors threatening the existence of edible orchids included habitat destruction mostly caused by shifting cultivation, opening of dimba (vegetable) gardens in the dambos, and overexploitation due to high demand. In addition, the localized occurrence of edible orchids predisposes them to extinction.

Propagation potential, indigenous conservation and management practices: Presently edible orchids are not artificially propagated. From time immemorial people have sustained the productivity of edible orchids through selective harvesting whereby only those plants that have tasselled are harvested and also only a plump tuber is extracted from the ground leaving a shrived tuber to regenerate the next season. The traditional knowledge of pests and diseases of edible orchids is obscured. However, rodents, mice, grasshoppers and monkeys, were reported to feed on them, thus may be considered pest if artificially grown.

Orchid's utilization

Edible orchids play an important role in the livelihoods of most people who live around the areas where they occur. Results from this study indicate that edible orchids are mostly used for food, medicine and as a source of income. Processed orchids are eaten either as relish or just as a snack. As medicine, orchids are used in the treatment of many diseases. Furthermore, trading in edible orchids is profitable such that it is becoming a major source of income for those people who are involved in its marketing.

Food: All respondents indicated that they ate edible orchids and most of them (71%) reported that they ate very often (at least once a week) when in season. People believe

that chinaka protect them from diseases, and provides energy. Chinaka is also a delicacy. About 88% of the respondents ranked it as the best relish when compared to meat, fish and vegetables. The most preferred species is *S. cursonii*, but in general female orchids are most preferred to male. Mixing female and male orchids is done to improve quality (texture and colour) and taste. The quality of chinaka is also influenced by expertise and experience in cooking.

Documentation of the preparation process of chinaka was also carried out. It involves cleaning the tubers and pounding them in a mortar using a pestle. The pounded tubers are then cooked together with a locally made baking powder called *chidulo* or sodium bicarbonate for a few minutes until a hard starchy substance is produced. This is normally left for sometime to cool and solidify. Upon cooling, the starchy substance becomes thick and viscous. It is then cut into small pieces and cooked with groundnut sauce, or tomatoes, ready to be eaten as relish. The cooked pieces can also be simply eaten as a snack.

Medicine: Out of the households interviewed, 61% indicated that they used orchids to treat a number of diseases. For instance, the tuber is used in the treatment of fortanelle, coughing, abdominal pains, heart attack, eye sores, ring worm, rheumatism and kidneys. The use of orchids for medicinal purposes was particularly pronounced in Kasungu District where 38 households indicated that they used orchids for medicinal purposes while as in Mzimba district, only 7 households indicated its use for medicine. Orchids were mostly used in the treatment of fortanelle, ring worms and abdominal pains.

Income: About 96% of the respondents sold orchids to supplement their income. At household level, the sale of orchids was dominated by women (94%) though a small number of men were reported to be involved in the sale of orchids, unlike in orchid collection where no men were involved. Average revenue obtained from the sale of orchids varied quite substantially, but most households reported an average revenue of around K3,000 (US\$20) per month.

Results from this survey also revealed that there is substantial cross-boarder trade for raw orchids between Malawi and Zambia. Most trading agents who bought orchids from the producers were from Zambia. Active cross-boarder trade was reported to be taking place at Jenda market in Mzimba District which is close to the Zambian boarder. However, no data was collected for the estimation of quantities sold and its impact on orchid diversity and conservation in Malawi.

DISCUSSION

Results from the social economic survey have established that edible orchids contribute significantly to household

Table 2. Food composition of raw edible orchids of Malawi.

Food component	Composition (in terms of 100 grams of edible portion)	Measure
Food Energy	115	Calories
Moisture	70	Percent
Protein	1.3	Grams
Fat	0	Grams
Carbohydrates (including fiber)	27.6	Grams
Ash	1.1	Grams
Calcium	48	Milligrams
Iron	7.8	Milligrams

Source: Extracted from Wu Leung et al. (1968).

income, food security and medical support. An average income contribution of US\$20 per month is quite substantial for a rural household in Malawi. On the other hand, its contribution to food security can not be ignored when the majority of the households eat orchids more than once a week when in season and when it is ranked as the best in comparison to meat and fish. Its use for traditional medicine is an added advantage to those communities who have knowledge of its medicinal potential. These results are in agreement with those obtained by Pungulani (2006), Phingo News (2003), Hamisy, (2007), and Davenport and Ndangalasi (2003). They highlight the important role that wild edible orchids play in people's livelihood.

The belief that chinaka protects people from diseases, and provides energy, can be verified from the food composition of a typical raw edible orchid from Malawi (Table 2). The table shows that raw edible orchids have high nutritional and medicinal values. In particular, the absence of fat and the relatively high content of iron make it outstanding. However, the use of chidulo or sodium bicarbonate during the preparation of chinaka may lower its nutritional value. Further research could therefore look at the nutritional value of chinaka.

We believe that there are a number of edible orchid species which have not been scientifically identified and described. During the reconnaissance and ethnobotanical surveys, we were unable to identify a number of species of edible orchids. Thus, there is a need to engage a taxonomist to attach botanical names to all species. In addition, it is also important to ascertain whether some species (for example *S. cursonii*) which grow in two different ecosystems are indeed one species. Thus, techniques such as molecular marker techniques could be useful in studying the diversity of these orchids thereby understanding the extent to which the current utilization is threatening their sustainability. We support the initiative reported by Golding (2003) whereby a number of long-term investigative studies have been undertaken to determine the species that are being harvested in southern African countries. It is reported that scientists purchase tubers from market places and then cultivate

and propagate them. Upon flowering, the orchids are identified to the species level. We would encourage the extension of such studies to Malawi, Zambia and Tanzania where most edible orchids have not been identified.

As we have already observed, edible orchids are currently not being propagated artificially for commercial purposes. We therefore agree with Pungulani (2006) and others that in order to sustain the availability of edible orchids there is need to strengthen research on the domestication of these species, so as to enable farmers to cultivate them. Thus, research and policy should emphasize on propagation protocols, tissue culture, and other biotechnological and agronomic issues that will eventually lead to domestication of different species of edible orchids, as has been the case with other tropical non-edible orchids.

Although no species of edible orchids has been reported to have become extinct, there are indications that the availability of some species is decreasing while their consumption is increasing. This is in line with observations from Tanzania where based on herbarium records and field observations, van der Niet and Gehrke (2005) provisionally assessed *D. walteri* and *S. johnsonii* as critically endangered and *S. aberrans* and *S. comptum* as endangered. It is not surprising that some 58 orchid species have been placed on Zambia's red list as extinct and threatened, lower risk and data deficient (Bingham and Smith, 2002), whereas in Malawi, 51 are listed (Msekandiana and Mlangeni, 2002). Some of these species could be edible and may be threatened by overexploitation. Furthermore, the listing of these species was done some years ago and may be out-dated. A new compilation could probably give more accurate information regarding the status of some edible orchids in these countries.

As expected, there is flourishing local trade in edible orchids and substantial cross-border trade for raw orchids between Malawi and Zambia. This is in line with what a number of researchers (Davenport and Ndangalasi, 2003; Bingham and Smith, 2002; Bingham and Kokwe, 2001; Golding, 2001; Ng'uni et al., 2001), have

reported regarding the rise in demand for orchids in Zambia. However, no comparisons can be made between the extent of trade in Malawi and Tanzania because no data was collected on the quantities of edible orchids sold per period of time. This is an important area for future research since the consequences of local and cross-border trade on the conservation, diversity and sustainability of wild edible orchids in Malawi is of great concern to all stakeholders.

It should be pointed out that although there is this flourishing cross-border trade, all orchids are nevertheless protected by the Convention on International Trade in Endangered Species (CITES). Eight species of orchids are listed under Appendix 1 of the CITES while the rest are under Appendix 2. Appendix 1 lists species that are most endangered among CITES-listed animals and plants. They are threatened with extinction and CITES prohibits international trade in specimens of these species except when the purpose of the import is not commercial, for instance for scientific research. Appendix II lists species that are not necessarily now threatened with extinction but that may become so unless trade is closely controlled. Permits or certificates are granted if the relevant authorities are satisfied that certain conditions are met, ensuring that trade will not be detrimental to the survival of the species in the wild. It would therefore be important to establish the extent, dynamics and implications of the cross-border trade in edible orchids, and later to monitor and regulate it.

Conclusion

considering the valuable contribution of edible orchids to people's livelihood and the indications that its availability is decreasing while its consumption is increasing, a number of interventions focusing on its conservation are needed. Such interventions may include, identification of all edible orchids, domestication of edible orchids through artificial regeneration, and trade regulation.

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