

Wild vegetables used by the Sambia in the Usambara Mountains, NE Tanzania

Katariina Vainio-Mattila

Vainio-Mattila, K., Department of Ecology and Systematics, Division of Systematic Botany, P.O. Box 7 (Unioninkatu 44), FIN-00014 University of Helsinki, Finland

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The utilization of wild green leafy vegetables was studied among the Sambia people in the East and West Usambara Mountains, Tanzania. Seventy-three species of wild vegetables representing 26 families were recorded in the interviews and inquiries. These plants, locally known as *mchicha*, are commonly eaten as a form of stew, *mboga*, which is served as a sidedish of staple food, e.g., maize porridge (*ugali*). The majority of the informants stated that they use wild vegetables more than the cultivated ones. Wild vegetables are regarded as easily obtainable and palatable. Some of the recorded species are not indigenous but naturalized. Most of the recorded species are ruderal, growing by the roadsides and as weeds of arable land.

Key words: Africa, ethnobotany, Sambia, Tanzania, Usambara Mts, wild vegetables

INTRODUCTION

Even if the African lifestyle is rapidly changing into permanent agriculture and urbanised way of life, hunting and gathering remain important to many rural households in Africa (Ogle & Grivetti 1985). Differences in climate, soil and vegetation are reflected in differences in the availability and use of edible plants. Some wild foods are commonly eaten, whilst other types of gathering characterize a particular biome of certain area or indigenous traditions of certain ethnic group. The extent of the use of wild green leafy vegetables varies in different lifestyles across Africa: a greater diversity of species are used in agricultural and

agro-pastoral communities than among hunter-gatherers, because disturbed habitats created for these “weedy” species at cattle posts and fallow fields (Anonymous 1997).

Heine *et al.* (1988) made notes on wild vegetable plants in an ethnobotanical survey of the semi-arid and arid lands of East Africa, carried out by among the Chamus (Kenya), So (Uganda), Rendille (Kenya), Borana (Kenya and Ethiopia) and Samburu (Kenya). A checklist of edible wild plants of Sub-Saharan Africa made by Peters *et al.* (1992) also includes the plants that chimpanzees and baboons eat. Johns *et al.* (1996b) recorded 53 cultivated food plants and 38 species of edible wild fruits and leafy vegetables during the course

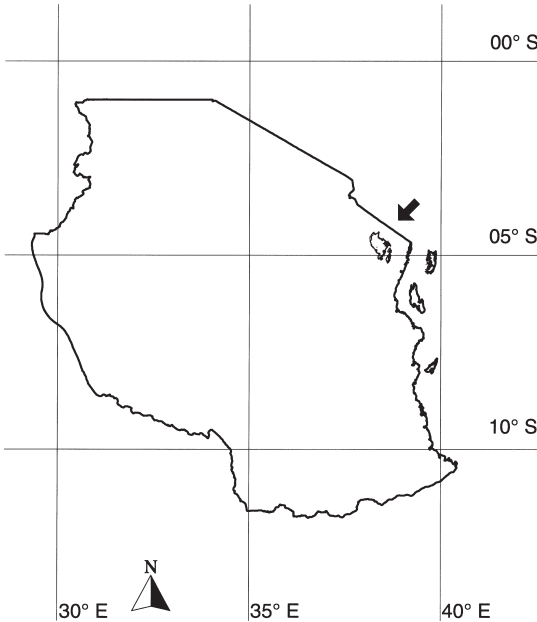


Fig. 1. Location of the Usambara Mountains within Tanzania.

of ethnobotanical interviews with 51 informants in Mara Region, Tanzania. Johns & Kokwaro (1991) surveyed wild plants including 29 species of wild leafy vegetables used for food by the Luo in Siaya District, Kenya. Johns *et al.* (1996a) recorded 35 cultivated food and beverage plants and 44 edible wild plants used by the Batemi of Ngorongoro District, Tanzania.

The people of the Usambaras traditionally use a wide variety of forest products (Iversen 1991b). In general, people highly depend on the natural environment for their survival (Modest Mrecha, pers. comm.). Fleuret (1980) recorded 78 medicinal plant species in the Usambaras. A list of forest species used by the local communities in the E Usambaras for various purposes (timber, poles, fuelwood, fruits and dyes, ropes, tool handles, kitchen utensils, plywood) is given by Ruffo (1989). Fourteen traditional healers in the East Usambaras use as many as 185 species of plants in the treatment of 63 kinds of diseases and conditions (Ruffo *et al.* 1989). Fleuret (1979a) recorded more than 15 species of wild leafy vegetables in her nutritional study in Lushoto District. Woodcock's (1995) study on indigenous knowledge and forest use in the East Usambaras includes 25 wild leafy vegetables species.

Although a great deal of traditional East African plant-lore has already been published (Watt & Breyer-Brandwijk 1962, Kokwaro 1976, Hedberg & Hedberg 1982, Hedberg *et al.* 1983a, 1983b, Chhabra *et al.* 1987, Kabuye 1988, Chhabra *et al.* 1989, Ruffo *et al.* 1989, Chhabra *et al.* 1990a, 1990b, Mbuya *et al.* 1994, Härkönen *et al.* 1995), there is still much to learn, and collecting of the oral tradition and saving it is an urgent task, not only for the potential economic values, but also for its cultural importance.

STUDY AREA

The Usambara Mountains are situated within the Tanga Region in NE Tanzania between 4°24'–5°16'S and 38°10'–38°48'E (Fig. 1). The mountains are divided in two major blocks, the W and E Usambaras, separated by the Lwengera Valley, running N–S (Iversen 1991a). The W Usambaras are estimated to cover ca. 250 000 ha and the E Usambaras 40 000 ha (Iversen 1991b). The highest peaks of W Usambara reach about 2 300 m altitude. Nilo, the highest peak in the E Usambara, reaches 1 506 m altitude (Iversen 1991a).

The Usambaras belong to a chain of isolated mountains called the Eastern Arc. These mountains are among the most important centres of biodiversity in Africa. They are important on a national level as areas of water catchment, a culture base, a source of non-timber forest products and until recently as a source of timber. Their international importance is made up of a genetic resource of medicinal plants, timber trees, and other plants of economic importance, notably wild coffee and cultivated flowers such as *Saintpaulia* and *Impatiens* (Lovett 1988). The two main forest types in the East Usambaras are lowland forest (below 800 m) and submontane forest (above 800 m). Wet montane evergreen forests are to be found only in W Usambara above 1 400 m altitude (Mazumbai). Cultivated areas cover a significant part of the mountains, particularly in W Usambaras (58%; Iversen 1991a). The West Usambaras are more influenced by human activities than the E Usambaras.

There are 110 introduced and naturalized plant genera in the Usambaras. Over half (54%) of the naturalized taxa originate from America, about

41% are of Old World origin, and the remaining 5% are cosmopolitan or pantropical. Naturalized taxa in the Usambaras account less than 8% of the total flora, which is 2 960 species. The third (37%) of the non-indigenous species are typically weedy plants. Many of them have been fairly long established in the area, and they are rather arbitrarily distinguished from the indigenous weeds. Most of the naturalized taxa (89%) are growing on wasteland and roadsides (Iversen 1991a).

POPULATION AND FOOD SOURCES

The Usambara Mountains have been more or less continuously inhabited during the last 2 000 years by settled agricultural peoples (Schmidt 1989). Early reports from the period of German rule in the Usambaras stated that the mountains were sparsely populated (Iversen 1991b). Human pressure on the natural environment has been increasing throughout the German, British and independent administrations. By the time of the census 1988 the Usambara mountains had a population of approximately 400 000 inhabitants (Iversen 1991b). Based on the figures of the census 1988, the Usambaras had a population density of about 121 persons per square kilometre, which should be compared with the total population density of about 25 persons/km² in the whole country (Iversen 1991b). The majority of the inhabitants of the E Usambaras belong to Sambiaa tribe, but there are villages of newcomers, mostly around tea plantations (FINNIDA 1988). The population of W Usambaras consists of three main ethnic groups, Sambiaa (80%), Pare (10%) and Mbugu (5%; M. Mrecha pers. comm.). The local Sambiaa language is very rich in botanical and ecological terms (Sangai 1963).

The major subsistence crops are maize (*Zea mays*), cassava (*Manihot esculenta*), sweet potato (*Ipomoea batatas*), banana (*Musa* spp.), potato (*Solanum tuberosum*), various beans (*Phaseolus* spp.) and rice (*Oryza sativa*). Tea is a typical estate cash crop and cardamon and sugar cane are the major cash crops cultivated by small-scale farmers (FINNIDA 1988).

The predominant diet in the study area, like in many areas of Africa, consists of a starchy staple food (maize, cassava) and "sidedish" or "stew".

The starchy staple food is usually served as a form of porridge, *ugali*, when made of maize, or *bada*, when made of cassava and/or cooking bananas. The starchy staple food provides energy but it is low in nutrients. The stew (*mboga*) is prepared separately and is eaten with the staple food. The composition of the stew varies according to the season. In general, it consists of a mixture of onions, tomatoes and green leafy vegetables, with legumes such as peas or beans. Meat, fish or mushrooms are sometimes included.

As early as 1895, in the earliest years of the German colonial period in Tanzania, many species of wild leafy plants were noticed to be important in the diet of local people (Engler 1895). Fleuret (1979b) carried out nutritional studies in Lushoto District (West Usambaras) and found that three quarters of all meals surveyed contained some side dish, either meat, beans, fish, sour milk, nuts, or vegetables, with the exception of breakfast. The single most frequent accompaniment was some form of green leafy vegetable labelled by local informants as *mchicha*. According to Fleuret (1979a) wild greens and fruits are important sources of many of the nutrients (calcium and vitamin A particularly) thought to be lacking in the Sambiaa diet.

In comparison with cultivated plants, wild vegetables are often considered to be inferior in their taste and nutritional value. However, several studies (Santos Oliveira & Fidalgo de Carvalho 1975, Sreeramulu 1982, Ogle & Grivetti 1985, Ndossi & Sreeramulu 1991, Humphry *et al.* 1993) show that many species of wild green leafy vegetables are rich sources of nutrients. Santos Oliveira & Fidalgo de Carvalho (1975) claim that the use of leaves in human nutrition is not always considered with the importance it would deserve in some low protein diets. When limiting amino acid of main foods is lysine (as the in cereal based diets) the protein of leaves may be of a great importance in its supplementation.

MATERIAL AND METHODS

Material was collected during two separate expeditions to the Usambara mountains, Tanga Region, NE Tanzania. The field work was carried out in Muheza District, the East Usambaras, in December 1995 (Vainio-Mattila *et al.* 1997), and

in Lushoto District, the West Usambaras, in October–November 1996. The villages of Amani, Kimbo, Maramba, Mbomole, Mgambo and Ubiri were visited in the East Usambaras. Kishiku, Mayo and Mazumbai were the study villages in the West Usambaras. The villages are of different sizes: the small Kishiku subvillage is inhabited by some few households, whereas Maramba has a population of more than 6 000 inhabitants.

The main research methods were interviewing, preference rankings, free-listing, market surveys and collecting voucher specimens. The food preparing processes were observed and some of the wild vegetable species were tasted when cooked. In the East Usambaras, the interviews were held in Swahili jointly with Mr. Leonard Mwasumbi, M.Sc., from the University of Dar es Salaam. Interviews were mainly carried out among the Sambaa people. Knowledgeable villagers were chosen as informants. In the East Usambaras, seven women (3 from Sambaa tribe, 2 from Pare tribe, 1 Bondei and 1 Ngoni), and 3 men (all Sambaa) were interviewed. Ages of the informants varied from 23 to 43 years. A questionnaire was used (Table 1). In addition, a few spontaneous inquiries were made.

In the West Usambaras, the interviews were

carried out in Sambaa language, Mr. Modest Mrecha, M.Sc., Manager of the Mazumbai Forest Reserve, acting as a field assistant and interpreter. The number of interviewees was thirteen (eight men and five women). All of them were Sambaa, and most of them had always lived in the area. All the informants in Mayo and Kishiku villages were subsistence farmers and had primary education. Ages of the informants varied from 18 to 62 years. However, in Mazumbai also group of four young men (aged 16 to 32) working as pit-sawyers were interviewed. They did not originate in this area, but they were all born in Lushoto District. The interviews were tape-recorded and partly also video-filmed.

Voucher specimens were collected of each wild vegetable species for documentation, identification and further studies. In the East Usambaras, the specimens were collected by the author together with Kari Lahti and Leonard Mwasumbi, and in the West Usambaras together with Kari Lahti and Outi Vainio. The specimens are deposited at the Herbarium of the University of Helsinki (H). Duplicates were delivered either to the Herbarium of the University of Dar es Salaam or to the Herbarium of the Tanzanian Forest Research Institute, which is located in Lushoto.

Table 1. Questionnaire.

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- I. Personal data of the informant
Name, sex, age, language, tribe/ethnic group, occupation, education (primary/secondary), origin
- II. General questions
1. Which do you prefer, cultivated vegetables or the wild ones? Reasons?
 2. Which ones are consumed more in your household?
 3. How often do you eat wild vegetables?
 4. How do you prepare wild vegetables for food?
 5. Do you preserve or store wild vegetables?
 6. Who collects plants in your household?
 7. Do you collect wild plants for sale?
- III. More detailed questions, concerning each of the plants named/pointed by the informant
1. Why do you use this plant?
 2. Which part/parts of the plant is/are edible?
 3. Does this plant demand any special cooking methods?
 4. Where does this plant grow?
 5. Is this plant common or rare?
 6. Is this plant for sale at the markets?
 7. Does this plant have any other uses?
 8. When do you collect this plant? (When is it available?)
 9. How important is this plant for your household? (*/**/****) Reasons?
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RESULTS

Fifteen out of the 23 interviewees preferred wild vegetables to the cultivated ones. However, in three cases (all in the East Usambaras) cultivated vegetables were used more than wild ones. In the West Usambaras, even those informants stating that they prefer cultivated vegetables actually used wild ones more often. In many cases 3/4 of all used vegetables were estimated to be wild. Wild vegetables are regarded as easily obtainable and available all the year round. They are palatable and can be prepared without cooking oil, which is expensive. Those informants preferring cultivated vegetables regarded them as more easily obtainable. According to their opinion collecting of wild plants is troublesome due to their seasonal occurrence (mostly dependent on rainy season). However, the good taste of many wild species was appreciated by them as well.

Species used

Altogether, 73 species representing 26 families used as wild green leafy vegetables among Sambia were recorded (Table 2). Of the total amount 46 species representing 18 families are used in the East Usambaras and 55 species from 22 families in the West Usambaras. Twenty four species (33%) are common. The most important families in the East Usambaras are Amaranthaceae, Asteraceae and Brassicaceae, whereas in the West Usambaras they are Acanthaceae, Amaranthaceae and Asteraceae. The most favoured and important species in the East Usambaras are *Basella alba* L. (*ndeleva*) (Fig 2), *Dioscoreophyllum volkensii* Engl. (*msangani*) and *Launea cornuta* (Oliv. & Hiern.) C. Jeffrey (*mshunga*). These are considered to be easily obtainable, abundant and easy to prepare for food. In addition they taste good. Also *Solanum nigrum* L. (*mnavu*) and *Amaranthus* species are popular. Sometimes *mnavu* is preferred to *mshunga*, because the latter is more seasonal in its occurrence.

Amaranthus spinosus L. (*Bwache*), *Amaranthus lividus* L. ssp. *polygonoides* (Moq.) Probst (*buuza*), *Rorippa nasturtium-aquaticum* (L.) Hayek

(*salade*) and *Nicandra physalodes* (L.) Gärtn. (*zinge*) are the most favoured (tasty) species in the West Usambaras. However, the most used and important wild vegetables in the West Usambaras according to preference rankings are *Bidens pilosa* L. (*mbwembwe*), *Galinsoga parviflora* Cav. (*ngezera*) and *Amaranthus spinosus* (*bwache*). These are easy to find and abundant. In addition they taste good. The taste of *Amaranthus hybridus* L. (*mchicha*) is highly appreciated both in the East and West Usambaras. However, this species is commonly cultivated.

Collection of wild vegetables

Wild vegetables are almost solely collected by women and children. They are mostly picked in home gardens and farmland or along the roads and footpaths. Collection is normally undertaken on the return from shamba or while collecting firewood. The most used species are easily available all the year round. Plants are usually collected in vegetative stage, when the leaves are young and fresh. Sometimes only the leaves are picked (for instance in the case of *Basella alba*). Usually, only the amount needed each time is collected, but occasionally the leaves of *Launea cornuta* and *Rourea orientalis* Baill. are dried and stored. The most favoured species are collected and used in four days a week on average.

Many of the species are collected for sale. According to my observations, the market of Mombo (Lushoto District) was richest in wild vegetables; there were seven wild species recorded. In addition, some wild berries and cultivated *mchicha* (*Amaranthus hybridus*) were on sale.

Preparing of wild vegetables

Wild green leafy vegetables are used like spinach and eaten as a form of stew, *mboga*. The process of preparing wild vegetables for a meal is about the same, although details may differ from one species to another. *Mboga* is prepared from wild vegetables as follows: (1) Leaves and young shoots are sorted out, old leaves as well as the

Table 2. Wild vegetables used among Sambia in the Usambara Mountains, NE Tanzania. Vernacular names are in Swahili and Sambia, or Bondei, when mentioned. Naturalized species (according to Iversen 1991a) are indicated with an asterisk (*). All voucher specimens are collected by Vainio-Mattila *et al.*, and are deposited in the herbarium H (Helsinki).

Family/Species	Vernacular name	Vouchers	E Usamb.	W Usamb.
1. Monocots				
Araceae				
<i>Colocasia esculenta</i> (L.) Schott	kieze/eze/gimbi*	95-21, 96-72, 96-113, 96-114	x	x
<i>Xanthosoma sagittifolia</i> (L.) Schott	yugwa*	96-71		x
Commelinaceae				
<i>Commelina benghalensis</i> L.	nhkongo	96-87		x
<i>Commelina</i> sp.	kikongo majura	96-111		x
2. Dicots				
Acanthaceae				
<i>Asystasia gangetica</i> (L.) T. Anders.	tikini	95-32, 96-90	x	x
<i>Justicia anisophylla</i> (Mildbr.) Brummitt	n'tongoani /hongoani	96-124A		x
<i>J. engleriana</i> Lindau	n'tongoani /hongoani	96-124B		x
<i>J. heterocarpa</i> T. Anders.	unkobo	95-26, 96-121	x	x
<i>J. heterocarpa</i> T. Anders. ssp. <i>vallicola</i> Hedrén	unkobo	96-118		x
<i>J. calyculata</i> (Defflers) T. Anders.	kachuma/zuma	95-17, 95-47	x	
Amaranthaceae				
<i>Aerva lanata</i> (L.) Schultes	shaza/tebwa (bondei)	95-50, 96-130, 96-138	x	x
<i>Alternanthera sessilis</i> (L.) DC.	mkoswe	95-43, 96-145	x	x
<i>Amaranthus dubius</i> Thell.	bwache	95-19?	x	
<i>A. graecizans</i> L. ssp. <i>thellungianus</i> (Nevski) Gusev	buuza	95-60	x	
<i>A. hybridus</i> L.	mchicha*		x	x
<i>A. hybridus</i> L. ssp. <i>cruentus</i> (L.) Thell.	mchicha wa kizungu*	95-37	x	
<i>A. hybridus</i> L. ssp. <i>hybridus</i>	mchicha wa kizungu*	95-38	x	
<i>A. lividus</i> L. ssp. <i>lividus</i>	mchicha katongo	95-19	x	
<i>A. lividus</i> L. ssp. <i>polygonoides</i>	buuza	96-79		x
<i>A. spinosus</i> L.	bwache	95-30, 95-35, 96-105	x	x
<i>A. tricolor</i> L.	mchicha mavi ya mbuzi*	95-36	x	
<i>Celosia schweinfurthiana</i> Schinz	mchicha pori /shaza	96-76, 96-115, 96-140		x
<i>C. trigyna</i> L.	fungu msanga	95-39, 96-136	x	x
Asteraceae				
<i>Bidens pilosa</i> L.	mbwembwe /kisomanguo	95-2, 95-44, 96-78	x	x
<i>Emilia coccinea</i> (Sims) G. Don	limijangombe	96-135	x	
<i>Galinsoga parviflora</i> Cav.	ngereza	95-27, 96-69	x	x
<i>Launea cornuta</i> (Oliv. & Hiern.) C. Jeffrey	mshunga/mshunga wa bonde/mshumpuu	95-52, 96-134	x	x
<i>Sonchus oleraceus</i> L.	kwake (mshunga-kwake)	95-23, 96-84, 96-97	x	x
<i>S. schweinfurthii</i> Oliv. & Hiern.	mshunga/mshunga- pwapwa	95-1, 96-101	x	x
Basellaceae				
<i>Basella alba</i> L.	ndeleva	95-49, 96-81, 96-100	x	x

Continued

Table 2. Continued.

Family/Species	Vernacular name	Vouchers	E Usamb.	W Usamb.
Boraginaceae				
<i>Trichodesma zeylanicum</i> (Burm.f.) R.Br.	sesemranda	95-57	x	
Brassicaceae				
<i>Brassica juncea</i> (L.) Czern	figiri*	95-10, 95-54	x	x
<i>Brassica</i> sp.	simwache	95-65	x	x
<i>Brassica</i> sp.	komba	96-108, 96-125		x
<i>Cardamine trichocarpa</i> A. Rich.	kisegeyuu	95-34, 96-116, 96-143, 96-144	x	x
<i>Cardamine</i> sp.	kisemusemu	95-66	x	
<i>Rorippa nasturtium-aquaticum</i> (L.) Hayek	salade	95-13, 96-85	x	x
Capparidaceae				
<i>Gynandropsis gynandra</i> (L.) Briq.	mgagani	95-41, 96-142	x	x
Caryophyllaceae				
<i>Stellaria media</i> (L.) Vill.	kidendelezi	96-89		x
Connaraceae				
<i>Rourea orientalis</i> Baill.	kisogo	95-58	x	
Convolvulaceae				
<i>Ipomoea aquatica</i> Forsk.	talata	95-42, 96-147	x	x
<i>I. batatas</i> (L.) Lam.	nkutu /matembele*	95-3, 96-73	x	x
<i>Ipomoea</i> sp.	rongwe	95-62	x	
Cucurbitaceae				
<i>Cucurbita maxima</i> Lam.	ukoko/ngoko*	95-14	x	
<i>C. moschata</i> (Lam.) Poir	nhoko	96-83		x
<i>Cucurbita</i> sp.	machuchuki	95-67	x	
<i>Cucurbita</i> sp.	imiwa*	96-127		x
<i>Cucurbita</i> sp.	bodwe*	96-128		x
<i>Momordica foetida</i> Schumach.	ushwe	95-51, 96-107	x	x
<i>Sechium edule</i> (Jacq.) Sw.	mchuchu*	95-25	x	
<i>Zehneria scabra</i> (L.f) Sond	nkweyamzue	96-112		x
<i>Zehneria</i> sp.	kangedele	96-102		x
Euphorbiaceae				
<i>Erythrococca kirkii</i> (Muell. Arg.) Prain	mnyembeue	95-48, 95-61	x	
<i>Manihot esculenta</i> Crantz	kisamvu*	96-74	x	x
Fabaceae				
<i>Ormocarpum kirkii</i> S. Moore	kiumbu	95-59	x	
<i>O. trichocarpum</i> (Taub.) Harms	kiumbu	96-133		x
Lamiaceae				
<i>Platostoma africanum</i> Beauv.	kisungu	95-6	x	
Lobeliaceae				
<i>Lobelia fervens</i> Thunb.	shambaai/shambaee	95-28, 96-129	x	x
Menispermaceae				
<i>Dioscoreophyllum volkensii</i> Engl.	msangani	95-15, 95-31	x	
Moraceae				
<i>Morus indica</i> L.	mlobe	96-70		x
Oxalidaceae				
<i>Oxalis corniculata</i> L.	kidadaishi	96-98		x
Passifloraceae				
<i>Passiflora edulis</i> Sims	mkakaa	96-86		x
Polygonaceae				
<i>Rumex</i> sp.	nywanywa	96-99		x

Continued

Table 2. Continued.

Family/Species	Vernacular name	Vouchers	E Usamb.	W Usamb.
Portulacaceae				
<i>Talinum portulacifolium</i> (Forssk.) Schweinf.	tonge	96-110		x
Solanaceae				
<i>Cyphomandra betacea</i> (Cav.) Sendtn.	ngogwe*	95-12, 96-75	x	x
<i>Nicandra physalodes</i> (L.) Gärtn.	mnavu zinge/mnavu kichaa/kibwabwa/ mgagani/zinge	95-20, 95-33, 96-104, 96-119	x	x
<i>Physalis peruviana</i> L.	mchupwa /mtumbua	95-24, 96-77	x	x
<i>Solanum nigrum</i> L.	mnavu/mnavu buche	95-53, 96-82	x	x
Tiliaceae				
<i>Corchorus olitorius</i> L.	kibwando	95-46	x	
<i>C. tridens</i> L.	kibwando		x	
<i>C. trilobularis</i> L.	sesemranda /mlenda	96-132		x
<i>Grewia kakahamnos</i> K. Schum	mnangu	96-146		x
<i>Triumfetta annua</i> L.	hombo ya msitui/hombo	96-106, 96-120		x
<i>T. trichocarpa</i> Hochst.	hombo kibwando	96-126		x
Urticaceae				
<i>Droguetia debilis</i> Rendle	mbawa	96-68		x
<i>Pouzolzia parasitica</i> (Forssk.) Schweinf.	kanyandee	96-122		x
<i>Urera hypselodendron</i> (A. Rich.) Wedd.	bwete	96-123		x

petioles are removed; (2) leaves are cut once or twice, after that they are rinsed; (3) leaves are boiled shortly, and then squeezed dry, the water used for boiling is not used for other purposes; (4) leaves are cooked in water or oil for 15 min. to 1/2 an hour, usually together with tomatoes and onions; (5) salt is added, but rarely other spices.

Preboiling is not always needed before cooking. However, some species are so bitter in taste that they need to be boiled longer or twice. The bitter ones are often mixed with other vegetables. An example of commonly used but bitter species is *Launaea cornuta* (*mshunga*), which is occasionally prepared with coconut milk or certain other vegetable species, to make the taste milder. Some leaves impart a mucilaginous consistency to the sauce, e.g. *Basella alba* (*ndeleva*). Lime or lady's fingers (*Abelmoschus esculentus*) can be used instead of tomatoes. Sometimes leaves are first dried and pound to powder, which is then boiled in water in order to make soup (e.g. *Triumfetta annua* L.).

DISCUSSION

According to several informants wild green leafy vegetables "increase the amount of blood in the body" (*see* also Woodcock 1995), which is likely to refer to the high iron content of many wild greens. However, the chemical analyses were beyond the scope of this study, and therefore, the information on the nutrient contents is entirely based on literature. *Launaea cornuta*, one of the most used wild leafy vegetable among the Sambaa, indicated high levels of protein, crude fibre, vitamin C, and minerals (Na, K, Ca and Fe) in the chemical analyses made by Ndossi and Sreeramulu (1991). In the analyses made by Humphry *et al.* (1993) protein values of several wild plants exceeded 20%, including *Amaranthus hybridus* and *Corchorus tridens* L. Other species contained high concentrations of calcium, iron, copper, and/or zinc, e.g. *Gynandropsis gynandra*. Ogle and Grivetti (1985) analysed protein and mineral values for 29 important wild plant species consumed

in Swaziland. Leaf protein ranged from 1.30 to 7.50%; the highest values were from the genera *Grewia*, *Momordica* and *Pouzolzia*. High calcium sources were *Corchorus* spp., *Grewia* spp. and *Pouzolzia parasitica*. Plants with a high iron concentration included *Corchorus* spp. and *Ipomoea* sp. Santos Oliveira and Fidalgo de Carvalho (1975) studied edible leaves of, e.g., four *Amaranthus* species mainly for their value as a protein supplement in common diets of Mozambique. Among the species studied, the most valuable protein supplement was *Amaranthus spinosus*.

Many of the species listed are introduced, pantropical or cosmopolitan. The former group is represented by some species of Solanaceae and Amaranthaceae, which originate from the Neotropics. The latter group is represented by, e.g., *Basella alba* (Basellaceae), *Bidens pilosa* (Asteraceae) and *Gynandropsis gynandra* (Capparaceae). Most species are ruderal; they grow by the road and trail sides, grazed ground, wasteland and as weeds in cultivations. Only a few species derive from forest (e.g. *Dioscoreophyllum volkensii*, Menispermaceae).

Most of the species used as wild vegetables are generalists, having a wide altitudinal amplitude. The differences in the species utilization between the East and West Usambaras is, to some extent, caused by the species distribution along the altitudinal range. *Rourea orientalis* is used in only one of the study villages situated in low elevation (200 m) in the East Usambaras. *Dioscoreophyllum volkensii*, one of the most favoured species in the East Usambaras, is almost missing from the data of the West Usambaras. Its vernacular name *msangani* was mentioned once, but no specimen was found.

The communities living next to public forest land or forest reserve use more forest derived species than the communities distant to reserves (e.g. Kishiku village) which predominantly collect from shamba and bushland due to lack of access to the forest. The group of four young men living in a forest camp and working temporarily as pit-sawyers in Mazumbai identified and used a higher number of species than any other informants, in-



Fig. 2. *Basella alba*, one of the most favoured wild leafy green vegetable in the E Usambara Mts.

cluding species that were unknown to the others. For instance, the use of the forest derived Urticaceae-species (e.g. *Pouzolzia parasitica* (Forssk.) Schweinf. and *Urera hypselodendron* (A. Rich.) Wedd.) is restricted to Mazumbai.

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