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NUTRITIONAL PROFILE OF SOME SELECTED FOOD PLANTS OF OTWAL AND NGAI SUB COUNTIES, OYAM DISTRICT, NORTHERN UGANDA

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ABSTRACT

Wild food plants play an important role in the diet of inhabitants of Oyam District. Some of these plants are drought-resistant and gathered throughout the year. These wild foods are an important source of nutrients. However, there is a lack of comprehensive data regarding the nutrient contents of these indigenous plants. The purpose of this study was to document and assess the nutrient and mineral contents of the selected food plants. Ethnobotanical surveys were used to collect data through formal and informal interviews and focused group discussions. Voucher specimens were collected during field excursions and taken to Makerere Herbarium for proper identification. Nutrients and mineral analyses of wild and cultivated fruits, seeds, underground organs and vegetables from Ngai and Otwal sub counties were carried out using known procedures. They were analysed for mineral nutrients such as calcium, iron, potassium, and phosphorus concentrations. Additionally nutrients such proteins, beta carotene, vitamin C and dietary fibre were determined. On average, vegetables were found to be richer in organic nutrients and minerals followed by fruits and seeds in that order. Generally the wild food plant species were found to be richer sources of mineral nutrient than their cultivated relatives. For example, the highest concentration of calcium 867.59 mg/100g was found in *Acalypha bipartita* leaves compared to 294.18 mg/100g in *Cleome gynandra*. Plant species that showed high iron contents [>30%] were leaves of swamp hibiscus, African spider flowers, fruist of Tamarind, Black night shade and Jews mallow. It was also noted that among the food plant species analysed, fruits were low in nutrients and mineral elements. Some of these food plants were also considered to have medicinal properties by the locals such as African spider flower, Rattle pod among others. However, it should be noted that there is a general decline in the consumption of wild plants, despite the apparent high nutritional values. The conservation of wild food plants is not taking place among the communities in the study area, thus the poor rural communities who are limited on balancing their diet could be faced with diseases associated with nutrient deficiencies.

Key words: Wild food plants; Nutrient; Mineral

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INTRODUCTION

Rural households of Uganda rely heavily on plant resources for food, fodder and herbal medicine [1]. Tabuti [1] further reported that savanna grassland ecosystems contain many plant resources of economic values such as foods. These plant resources are widely relied on by rural communities in developing countries because they are freely found in the wild. Wild food plants and locally produced foods are valuable and important nutrient contributors in the diet both in rural and urban areas, but most importantly in the rural areas [2].

Uganda is endowed with a high diversity of indigenous food plants. Traditionally, vegetables were gathered from cultivated lands near homesteads and sometimes together with uncultivated fruits from bushes and forests in the vicinity. Some of them have higher protein, phosphorus, iron, vitamin and carotene contents than the exotic, high-yielding vegetables that have progressively replaced them since colonial times [3].

This study was conducted in areas which were insecure for over 20 years as a result of civil strife. The people were confined in IDPs (Internally Displaced People's camps) from around 2003 to 2007. The IDPs were government-protected settlements with limited access to food sources. The people in the area relied on relief food and wild food plants to meet the daily dietary requirement.

Thus, an ethnobotanical study is important to highlight people's usage of plant material for their daily nutritional needs. However, the war and other conditions have limited such studies in Oyam District, thus lack of comprehensive nutritional composition of these plants.

Wild food plants are incorporated into the normal livelihood strategies of many rural people and are usually considered as additional diet to rural people. However, one has to bear in mind that wild fruits add crucial vitamins to the normally vitamin deficient cereal diet, particularly of children [3, 4, 5]. They (wild food plants) grow in both farmlands and uncultivated habitats and are harvested for their nutritive values [6]. They represent important food sources during seasonal food shortage periods, and provide good nutritional supplies, notably minerals. In some cases, wild food plants may have some economic value in local markets [7].

Wild food plants suffer serious neglect, disregard, and erosion. Agricultural programmes envision their use as a "backward" food security practice, devoting very little attention, if any, to them [7, 8]. There is poor scientific knowledge and awareness on the values of wild food plants, such as their nutritional qualities, ecological features, and local uses [9].

In addition, the expansion of farming land and the intensification of unsustainable practices of natural resources management are further constraining the space available for some wild food plants, hence undermining their availability and use [7].

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To consider food as medicine is part of a culture and a millennial human practice, in fact, ancient documents, testify the consumption of many plants in order to prevent numerous illnesses. Today, more advanced scientific research reveals that human health is directly connected to nutrition [10].

The nutritional value of wild food plants is of interest to ethnobotanists, clinicians, chemists, nutritionists and anthropologists. There is no definitive resource available containing this information for African wild food plants [11]. Thus nutritional chemists measure the qualities of specific nutrients found in edible plants in order to discover the extent to which they fulfill dietary requirements [12]. Identification, propagation, and introduction of nutritionally rich, indigenous plant species in the existing cropping system are important for the intervention in rural nutrition. A case study of Moringa [*Moringa oleifera* Lam.; Moringaceae], which is a common tree in Malawi and one of the richest sources of vitamin A and vitamin C compared to the commonly consumed vegetables has been used to address the problem of vitamin A deficiency [13].

Wild food plants also have a potential in the mitigation of AIDS impact, especially among the rural poor [14, 15]. Wild food plants represent inexpensive, locally available and versatile food sources capable of improving nutrition and health quality.

The objectives of this study were as follows:

- To identify and document food plants in the study areas;
- To assess the plant conservation practices in use in two sub-counties of Oyam district;
- To establish factors influencing use of wild food plants;
- To determine the nutrients profile of some selected food plant species.

MATERIALS AND METHODS

Study Area

This study was carried out in Ngai and Otwal sub counties in Oyam District which is situated in Northern Uganda on coordinates 02°14′N 32°23′E [16]. The sampling sites were located in the Parishes of Aramita, Akuca and Omac from Ngai sub-county and Abela from Otwal sub-county. The study was conducted from August 2007 to February 2008.

Data Collection

To collect these data direct questions about knowledge of nutritional plants were asked. These methods are explained in the textbook of ethno botany [12].
Information on food plants such as their mode of preparation, part consumed, status of each plant whether domesticated or wild was obtained through semi-structured interviews to focused group discussions. Respondents included men, women and children. Children between 8-15 years were particularly targeted since they interact

more with nature. However, a lot of emphasis was placed on the elderly in the community because of their knowledge of plants.

Some plant specimens were collected and included both wild and domesticated food plants and ranged from vegetables, seeds, fruits and underground organs. Tools used included; hoes and knives (these were used with caution to avoid Fe contamination); wood racks cotton threads, polythene bags and papers.

Collection of Voucher Specimens

Plant voucher specimens, were taken from different taxa and varieties found in the study area as were identified by respondents. As with all ethnobotanical studies, the aim of the study was to provide evidence for the identification of all scientific varieties and species and their correspondence with local nomenclature. A total of 51 voucher specimens were collected and delivered to Makerere University Herbarium where further identification and classification was done. Voucher specimens were collected according to standard practice, including roots, flowers, and fruits where possible [12].

Twenty laboratory samples were collected and delivered fresh to the Department of Food Science and Technology, Makerere University.

Laboratory methods

Twenty selected food plant samples were analysed for protein, beta carotene, vitamin C, iron, calcium, phosphorus and potassium.

Proximate analysis of the plants was performed to analyse for proteins.

Determination of nutrient contents of food plant samples

Determinations were made using standard methods as outlined by FAO [17a, b], for acid detergent method for fiber (ADF)], Micro-Kjeldahl analysis was used for nitrogen determination so as to calculate proteins and Vitamin C [17a, b].

Beta carotene was determined by spectrophotometric reading procedure [18].

Determination of Nutrient elements of plant food samples

Nutrient element concentrations of Ca, Fe, P and K were then determined from standard procedure [18].

Potassium and calcium were determined through flame photometer, iron through atomic absorption spectrophotometer and phosphorus through spectrophotometer.

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RESULTS

Documentation of food plants

A total of 110 respondents were interviewed from the study area (Table1) of these, 43 were females and males were 57 showing that, there were more men interviewed than females (57% and 43%, respectively). The highest numbers of respondents interviewed were in the age group of 50 years and above at 31%, followed by 27% for 25-37 years, 25% for 38-49 years and lastly 17% for 13-24 years.

A total of 51 food plant species were documented (Table 2) of which 74.5 % of the plants were collected from the wild while 25.5 % were of the cultivated and semi cultivated categories. Additionally plant species with medicinal values constituted 31.4%.

Fruits were the most consumed plant part constituting 58.8 %, followed by leaves with 23.5 %, seeds with 12 % and the rest were below 10 %. In addition, 56.9% of the plants were eaten raw while 43.1% were eaten in cooked or roasted form. All the fruits were consumed fresh while all vegetables and seeds are consumed when cooked.

Trees and shrubs made up 64.7% of food plants consumed while herbs and climbers constituted 29.4% and fungi formed 5.9%. Shrubs and trees were basically giving fruits and seeds which are consumed. Vegetables were mainly obtained from herbs.

Reason for use of wild food plants

The use of wild food plants among the people of Ngai and Otwal was reported to be mainly due to the fact that these plants are perceived to be nutritional. However, they also contribute to food security in times of food shortage/famine (Fig.1-). Some 15% of the food plants were also consumed because of perceived medicinal values.

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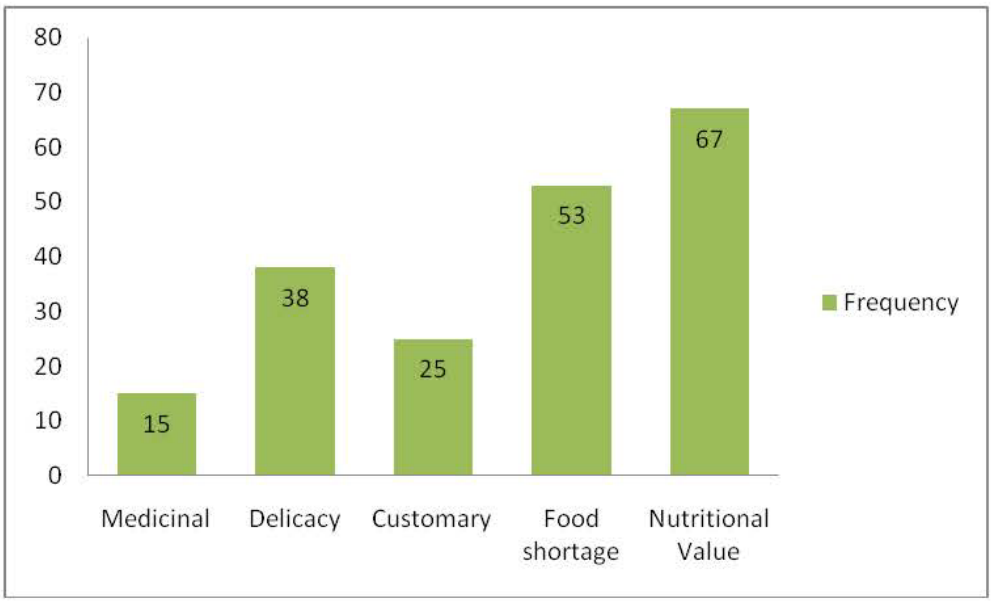

Figure 1: Reasons for eating wild food plants

Some 15% of the food plants were also consumed because of perceived medicinal values.

Gender roles in the collection of wild food plants

Women were found to be the main collectors of wild food plants compared to men and children (Fig.2). It was also noted that men, women and children would occasionally combine effort to collect wild food plants at any given time.

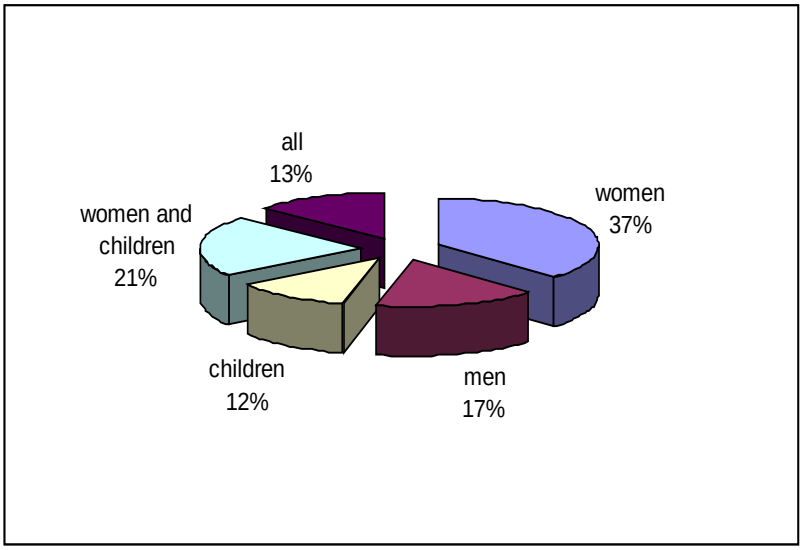

Figure 2: The gender roles in the collection of wild food plants

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Pattern of consumption of wild food plants

There was a reported decline in the use of wild food plants among the locals and the reasons being mainly seasonality of the plants and due to lack of time to collect these plants from the wild.

Nutrient composition of food plant species

Protein contents of food plants

The protein content of the vegetables (leaves) were higher than any other plant part analysed (Table 4). Only seven food plant species had protein contents greater than 20% and nine species had protein contents of less than 10%. Wild food plants such as *Amaranthus graecizans* had 34.08%, *Solanum nigrum* 27.80%, *Crotalaria brevidens* 34.47% and fruits such *Ficus sur* 9.35%, *Bridelia scleroneura* 5.68%. Thus comparing the wild and cultivated food plants, some of the selected wild food plants are richer in proteins than their cultivated counter parts.

Vitamin C and beta carotene contents of food plants

Vegetable parts of the investigated food plants contained higher concentrations of vitamin C, and beta carotene than all other edible parts (Table 4). Fruits had the second highest contents of both vitamin C and beta carotene. A total of 47.62% of food plant species had vitamin C contents greater than 0.5%.

Dietary fibre contents of food plants

The dietary fibres of the food plant species varied widely with no particular plant part leading in content (Table 4). On average, there are only marginal differences in fibre contents among the different plant parts investigated. For instance, the average fibre contents were 42.16%, 40.40% and 39.69% for fruits, seeds and vegetables respectively.

Mineral contents of food plants

Iron contents of food plants

Iron contents in *Hibiscus diversifolius, Cleome gynandra, Tamarindus indica, Solanum nigrum* and *Corchorus olitorius* were of greater than 30% (Table 4). Species with iron contents of less than 5% were fruits of *Ficus sur, Ficus sycomorus, Cucumis figarei, Bridelia scleroneura,* and seeds of *Hyptis spicigera*. Ten plant species had their iron contents falling between these two extremes.

Calcium contents of food plants

The highest concentration of calcium was found in the leaves of *Acalypha bipartitae* followed by *Amaranthus graecizans, Solanum nigrum, Crotalaria ochroleuca, Crotalaria brevidens* and *Corchorus olitorius* in that order (Table 4). On whole, vegetables had the highest calcium concentration compared to other plant parts analysed.

Phosphorus contents of food plants

Plant species that showed the concentration values of phosphorus greater than 500mg/100g were leaves of *Cleome gynandra, Acalypha bipartitae, Hyptis spicigera,*

Amaranthus graecizans, Solanum nigrum, Asystasia gangetica, seeds of *Cajanus cajan, Corchorus olitorius* and fruits of *Cucumis figarei* and *Ficus sur* (Table 4). The lowest concentrations of phosphorus of less than 200mg/100g were recorded in fruits of *Vitex doniana* and *Bridelia scleroneura*

Potassium contents of food plants

Six plant species which include *Asystasia gangetica, Ficus sur, Solanum nigrum, Corchorus olitorius, Cleome gynandra* and *Amarantus graecizans* concentration values of potassium exceeding 300mg/100g (Table 4). Only three plant species had concentrations falling between 200mg/100g and 300mg/100g. The plant species with the lowest concentrations of potassium (150mg/100g) were *Acalypha bipartita, Tamarindus indica, Vitex doniana, Mondia whiteii, Cajanus cajan, Crotalaria brevidens, Hibiscus diversifolius, Ceretotheca sesamoides, Bridelia scleroneura* and *Crotalaria ochroleuca*.

DISCUSSION

Documentation of Wild food plants

Wild food plants were found to grow in both farmlands and uncultivated habitats and were harvested for their nutritive values. In Ngai and Otwal sub counties, the greatest percentage of the wild food plants was collected from the wild. This similar trend was also observed among communities living in Mabira Forest Reserve [6]. This can be explained by the fact that natural habitats are far less disturbed than farmland hence they encourage the growth of a high diversity of plants unlike farmlands.

However, it should also be noted that for the people in the study area, food plants that were found growing in farmlands were usually more accessible and easily integrated in the day to day family food basket. The women during focus group discussions reported that as they attend to their farms, they could easily pick these plants as they return from their gardens.

It was observed that fruits were the forms in which food plants were commonly consumed by the local communities in the two sub counties of Oyam District. Fruits are forms of foods which do not require elaborate preparations and can, therefore, even be easily consumed by children. Cooked plant parts were the second most commonly consumed form of food plant parts in Otwal and Ngai sub counties in Oyam District. This was because women who constituted the highest percentage of wild plant collectors are the ones responsible for food preparation for their families.

Woody species constituted the highest percentage sources of wild food plants. This presented some advantages because they are perennial and hence more reliable sources of food. On the other hand, herbs which are seasonal constituted only a small percentage of food plants. Because of their seasonality, wild food plants are not reliable sources of food for the local communities.

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The most obvious reasons that were given for the consumption of wild food plants among communities of Ngai and Otwal, was that these plants were nutritious and in famine or periods of food shortage they contributed to household food security.

During the study, it was also noted that a large number of food plants [31%] were reported to have medicinal value, and the local communities ate them with full knowledge of their medicinal values. This is important since food and health are closely interlinked. Thus as these plants are being consumed as food, they also boost the nutritional and therapeutic needs of the persons eating them. Some of these plants include *Cleome gynandra, Mondia whiteii,* and *Crotalaria ochroleuca* among others. *Cleome gynandra* is used as a medicinal plant and is found all over world [19]. The plant has been used to treat a number of ailments ranging from headache, constipation, arthritis, epileptic fits, among others. This confirms other reports that various human societies have used wild plants for both food and medicine [20, 21, 22, 23, 24].

Nutrient Element Composition

Considering all the food plants in Ngai and Otwal sub counties, Oyam District analysed for nutrients and minerals, leaves had the highest concentrations of all the parameters investigated. Fruits and seeds came second and third respectively for the different substances analysed. Thus considering the nutritional values of these wild food plants coupled with medicinal values, these wild food plants, therefore provide very important sources of food and medicine for the local communities.

Plants that were high in proteins such as *Amaranthus graecizans, Cleome gynandra,* and *Hibiscus diversifolius* were found to be favorite foods among expectant mothers during the focused group discussions. Some of the wild food plants that were analysed for their nutrient content were found to meet the Recommended Dietary Allowance (RDA) of some minerals needed in ones diet. The RDA for phosphorus which is 700mg can be met by the following plants that is *Hyptis spicigera* 855.72mg, *Acalypha bipartita* 906.02mg and *Cleome gynandra* 1167.35mg exceeding RDA required. On the other hand, calcium RDA is met by *Acalypha bipartita (*867.6 mg), the RDA of which is 800mg and usually difficult to meet in vegetarian diet. The vegetables were found to be richer in the entire nutrient elements and as such if integrated in the daily diet of the local people would contribute significantly to RDA required by the body. This would hence reducing the prevalence of diseases associated with nutrient deficiencies, and thus boost the body immune system.

The respondents reported that leaves of *Crotalaria ochroleuca* which is semi cultivated were eaten to relieve stomachache. They were found to be high in beta carotene, proteins and calcium. *Hibiscus diversifolius* which is delicacy in the study area was reported by the respondents, to stimulate breast milk production in mothers and increase appetite. The plant species had high concentrations of iron, phosphorus and beta carotene, with moderate concentration of calcium.

Vitamin C which was high in these vegetables protects against scurvy a condition young people tend to be susceptible to. However, it was also noted that among the food plants analysed, fruits which were low in nutrients and minerals were the one being commonly eaten by children. These included *Vitex doniana, Aframomum angustifolium, Bridelia scleroneura, Ficus sur* and *Ficus sycomorus*. This type of diet alone may subject children to marginal nutrient and mineral deficiencies, making them more susceptible to infection and diseases [22]. However, these wild fruits are supplementary to the main foods prepared at home. The RDA for vitamin A was mostly met by eating just one gram of the vegetables while for the fruits and seeds it was necessary to eat more 5-6 grams. The fact that these plants are found growing in the wild and farmlands, they are easily accessed and children have often eaten them at any time and the amount of serving depends on how hungry the child is.

Other special delicacies which are prepared and consumed in Ngai and Otwal sub counties were actually found to be high in minerals and other nutrients. These were foods prepared in a variety of combinations. For instance *Cleome gynandra* is prepared in combination with *Solanum nigrum* or *Acalypha bipartita*, *Acalypha bipartita* provides a rich combination of nutrients as has been established through laboratory analysis. Thus this combination provides the optimal nutrients needed in the body, hence ensuring good health. The lack of knowledge to precisely identify appropriate diets, is overcome by the rich diversity of food sources in the vicinity of the local communities. Plant biodiversity offers useful perspectives on a number of issues of contemporary scientific and public health importance including, mineral deficiency and bioavailability, nutrition and disease, nutrition transition, and medicinal and functional activities of plants [25, 26, 27]. It is important to note that simplification of the diets of large numbers of people as a result of urbanization and socioeconomic changes presents unprecedented obstacles to human health associated with emerging diseases such as diabetes, hypertension and cancer.

Despite the apparent nutritive values of wild food plants, their consumption has declined among the people of Ngai and Otwal sub counties. The people argued that the decline was mainly due to the fact that these plants were seasonal and that they had become scarce in the environment, therefore necessitating domestication of these plants to ensure that they are included in household crops that are often cultivated. The children and mothers have to have their diet supplemented to ensure that they do not suffer from nutrient deficiencies as a result of low intake from the daily diet, for example by Vitamin A, folic acid, iron tables and Vitamin C to mention but a few . The emergence of new food crops is yet one of the main reasons why the consumption of wild food plants has declined as they act as substitutes [7, 20, 27]. It is obvious, however, that preservation of botanical knowledge is critical and justified because wild species with higher food values can be nutritional substitutes to cultivated food plants during economic hardship, drought, or periods of social and political unrest [8, 28].

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CONCLUSIONS AND RECCOMMENDATIONS

Of the total number of food plant species documented, 31.4% were perceived to have medicinal properties. Wild plants play an important role in the diets of inhabitants of Oyam District. The wild food plants were used as supplements to the cultivated crops and as famine foods between harvesting seasons. Results of this study reveal these wild food plants are rich in nutrients, some of which meet the RDA compared to their cultivated counter parts. The wild food plants were not only consumed for their nutritional value but they were also considered medicinal by the local people in the study area.

There is need to study the medicinal potential of some of these wild food plants and as well as the possible side effects of the plants so as to identify plants that may improve nutrition, provide health remedies, increase dietary diversity and tackle food insecurity. On the other hand, as wild food plants become scarce in their natural habitat because of environmental degradation, it is recommended that sensitization of the local communities be undertaken about the values of wild food plants This will probably win their support for the conservation of natural resources in their vicinity. In addition, the government through its agricultural outreach programmes should include strategies for inclusion of selected wild species such as A*calypha bipartita, Solanum nigrum, and Crotalaria brevidens* among others to be domesticated together with the common food crops.

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Table 1: Demographic characteristics of respondents in the study area

Respondents		**Total**
Males	Females	
58 [57%]	43 [43%]	101

Age Characteristics of Respondents

13-24 years	**25-37 years**	**38-49 years**	**50 years and above**
17 [17%]	27 [27%]	25 [25%]	32 [31%]

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Table 2: Plant species with nutritional and medicinal values, parts used, forms eaten and growth habits

Family	Taxon and collection Number	Status	Part eaten	Form eaten in	Habit
Acanthaceae	*Asystasia gangetica* [L.] T. Anderson AA-09-07	W	Leaves	Cooked	Climber
	Asystasia mysurensis T. Anders AA-37-07	W	Leaves	Cooked	Herb
Amaranthaceae	*Amaranthus graecizans* Auct.Non L AA-15-07	C	Leaves, seeds	Cooked or raw	Herd
	Amaranthus dubius Thell AA-23-07	W	Leaves	Cooked	Herb
Anacardiaceae	*Rhus vulgarius* Meikle AA-31-07	W	Fruit	Fresh	Woody shrub
	Mangifera indica L.* AA-51-07	C	Fruit	Fresh	Tree
Annonaceae	*Annona senegalensis* Pers. AA-50-07	W	Fruit	Fresh	Tree
Apocynaceae	*Carrisa edulis* [Forssk] Vahl. AA-21-07	W	Fruit	Fresh	Woody shrub
Arecaceae	*Borassus aethiopium* Mart AA-34-07	W	Fruit	Fresh	Tree
	Phoenix reclinata Jacq. AA-49-07	W	Fruit	Fresh	Tree
Asclepiadaceae	*Mondia whiteii* skeels* AA-01-07	W	Root	Fresh	Climber

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Caesalpiniaceae	*Tamarindus indica* L. AA-32-07	W	Fruit	Raw or cooked	Tree
Capparaceae	*Cleome gynandra* L.* AA-27-07	Sc	Leaves, tem	Cooked	Herb
Caricaceae	*Carica papaya* L.* AA-35-07	C	Fruit	Cooked, fresh	Tree
Compositae	*Sonchus oleraceus* L. AA-36-07	W	Leaves	Cooked	Herb
Cucurbitaceae	*Cucumis figarei* Delile AA-30-07	C	Fruit, seed	Cooked	Creeper
Dioscoreaceae	*Dioscorea bulbifera* L. AA-42-07	W	Fruit	Fresh	Climber
Euphorbiaceae	*Acalypha bipartita* Mull. Arg. AA-02-07	W	Leaves	Cooked	Herb
	Bridelia scleroneura Mull. Arg. AA-48-07	W	Fruit	Fresh	Tree
Fabaceae	*Vangueria apiculata* [L.] Walp* AA-47-07	W	Fruit	Fresh	Tree
	Lablab purpureus [L.] Sweet AA-33-07	W	Seeds	Cooked	Climber
	Cajanus cajan [L.] Druce* AA-17-07	C	Seeds	Cooked	Shrub
Labiatae	*Hyptis spicigera* Lam. AA-14-07	C	Seeds	Cooked	Shrub
Lamiaceae	*Hoslundia opposita* Vahl.* AA-47-07	W	Fruit	Fresh	Shrub

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Loganiaceae	*Strychnos innocua* Delile AA-22-07	W	Fruit	Fresh	Tree
Malavaceae	*Sida rhombifolia* L. AA-46-07	Sc	Leaves	Cooked	Shrub
	Hibiscus diversifolius L. AA-24-07	C	Leaves, seeds	Cooked	Shrub
	Hibiscus acetosella Welw.ex. Fic AA-24a-07	W	Leaves	Cooked	Shrub
Moraceae	*Ficus sycomorus* L* AA-44-07	W	Fruit	Fresh	Tree
	Ficus natalensis Hochst.AA-45-07	W	Fruit	Fresh	Tree
	Ficus sur Forssk AA-43-07	W	Fruit	Fresh	Tree
Olacaeae	*Ximenia americana* L. AA-20-07	W	Fruit	Fresh	Woody shrub
Papilionaceae	*Crotalaria ochroleuca* G.Don* AA-04-07	Sc	Leaves, flowers	Cooked	Shrub
	Vigna unguiculata [L.] Walp AA-18-07	W	Leaves	Cooked	Herb
	Crotalaria brevidens Benth. AA-41-07	C	Flower, leaves	Cooked	Shrub
Pedaliaceae	*Ceratotheca sesamoides* Endl. AA-40-07	C	Seeds	Roasted	Shrub

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Sapotaceae	*Butyrospermum paradoxum* [C.F. Gaertn] Hepper* AA-19-07	W	Fruit, seed	Fresh, cooked	Tree
Solanaceae	*Solanum nigrum* Acerb. Ex. Dunal AA-03-07	W	Leaves, fruit	Cooked, fresh	Shrub
	Physalis minima L. AA-07-07	W	Fruit	Fresh	Herb
	Capsicum frutescens Rodsch.* AA-26-07	C	Fruit, leaves	Fresh, cooked	Shrub
	Lycopersicon esculentum Mill. AA-16-07	W	Fruit	Cooked	Shrub
Tiliaceae	*Grewia mollis* Juss.* AA-05-07	W	Fruit	Fresh	Tree
Tricholomataceae	*Termitomyces aurantiaces* AA-38-07	W	Whole plant	Cooked	Fungi
	*Termitomyces microcarpus** AA-38a-07	W	Whole plant	Cooked	Fungi
	Termitomyces eurrhizus AA-38b-07	W	Whole plant	Cooked	Fungi
Verbenaceae	*Vitex doniana* Sweet* AA-12-07	W	Fruit	Fresh	Tree
	Vitex fischeri Gurke AA-12a-07	W	Fruit	Fresh	Woody shrub
	Lanatana camara L.* AA-13-07	W	Fruit	Fresh	Shrub

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Vitaceae	*Ampelocissus Africana* Lour. Merr AA-11-07	W	Fruit	Fresh	climber
Zingiberaceae	*Aframomum alboviolaceum* K. Schum AA-06-06	W	Fruit	Fresh	Shrub
	Aframomum angustifolium K. Schum* AA-39-07	W	Fruit	Fresh	Herb

Key: W-wild C-cultivated Sc-semi-cultivated

*-Plants with reported medicinal values by respondents

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Table 3: Reasons for the decline in the consumption of wild food plants by people in Ngai and Otwal sub counties

Reason for the decline in use	Freq	%
Lots of other food	32	24
Wild plants are scarce	45	34
Seasonality	45	34
Lack of time	4	3
Others	6	5

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Table 4: Nutritional composition and concentrations of food plants in terms of Protein, Vitamin C, Beta carotene, Dietary fiber, Iron, Calcium, Phosphorus and Potassium contents of food plant parts.

	Plant sample	Protein %	Vitamin C %	Beta carotene ug/g	Dietary fiber %	Iron %	Calcium mg/100g	Phosphorus mg/100g
Fruits	*Ficus sycomorus*	7.7	0.68	3.45	68.85	2.05	238.72	371.42
	Ficus sur	9.35	*	33.18	61.37	1.21	289.75	505.76
	Vitex doniana	3.04	0.31	20.37	47.09	9.14	80.04	126.43
	Bridelia scleroneura	5.68	0.24	14.27	46.26	2.65	124.48	157.67
	Tamarindus indica	4.95	0.53	13.91	14.96	45.18	101.42	304.92
	Cucumis figarei	18.54	0.60	10.83	39.56	3.76	150.00	509.79
	Aframomum angustifolium	9.45	0.35	22.33	17.36	6.66	96.35	345.00
Seeds	*Hyptis spicigera*	0.04	0.28	10.80	61.28	2.29	119.29	855.72
	Cajanus Cajan	18.02	0.40	14.11	17.98	18.39	65.99	555.33
	Ceretotheca sesamoides	8.91	0.33	30.42	41.95	4.99	321.93	206.72

Vegetables	*Crotalaria ochroleuca*	25.66	0.68	529.53	23.46	5.02	442.42	242.54
	Crotalaria brevidens	33.47	0.53	600.75	17.45	7.18	437.99	253.18
	Cleome gynandra	25.58	0.43	285.36	16.78	48.49	294.18	1167.35
	Acalypha bipartita	17.11	0.92	167.90	21.11	21.96	867.59	906.02
	Asystasia gangetica	18.91	1.40	643.00	70.67	13.87	349.50	785.95
	Hibiscus diversifolius	20.07	0.63	488.25	23.13	56.6	256.21	484.13
	Amaranthus graecizans	34.08	0.74	586.00	87.40	16.94	573.57	826.79
	Solanum nigrum	27.80	1.05	695.81	15.93	33.17	447.16	808.52
	Corchorus olitorius	25.29	0.76	736.36	81.25	32.60	428.45	545.82
Roots	*Mondia whiteii*	6.29	0.24	5.56	19.84	13.61	123.11	284.04

Key: *- No analysis done

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