IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT)
e-ISSN: 2319-2402,p- ISSN: 2319-2399.Volume 10, Issue 11 Ver. I (Nov. 2016), PP 65-71
www.iosrjournals.org

Diversity and Nutritional Values of Wild Fruits of Acholi Sub-region, Northern Uganda

Robert B. O. Loki* and Elly. K. Ndyomugyenyi
Department of Environment and Natural Resource Management, Department of Animal Production and Range Management, Gulu University, P. O. Box 166, Gulu, Uganda

Abstract: *A study was conducted in the districts of Gulu, Kitgum, Pader and Amuru to establish the diversity and nutritional value of Wild Fruits (WF) for human consumption. Epistemology of consumption of the wild fruit plant species was also assessed. A total of 206 respondents, which included formerly abducted children (FAC) and district officials were used for the study in two sub-counties from each district. Data were collected using structured questionnaires, observations and focus group discussions. Secondary sources of data were also reviewed. Most respondents who had knowledge, collected and consumed wild fruits were adults between 40-49 years and had little formal education. Fifty-one wild food plants species belonging to 35 families were recorded and 48% of the forest habitat was richest in wild fruit plant (WFP) species and water presented the least number (2%) of WFP species. Twenty six wild fruit plant species were identified and trees constituted the most common form of fruit plant species as compared to herbs. Among the edible parts, fruits were most widely eaten than seeds and were consumed mainly in raw form and thus required less preparation process. Most wild fruit species were richer in vitamin C (>1.0 x 10^2 mg/100g) and sugar (>5.5%). Although Vitellaria paradoxa was poorer in vitamin C (0.143 x 10^2 mg/100g) and sugar (2.43%), it recorded the highest protein (5.01%) and fat (2.75%) contents while phosphorus (51.7 mg/100g) and zinc (61.0 mg/100g) were highest in Passiflora edulis. The knowledge of wild fruit consumption was mainly informal, acquired from the parents, grandparents and friends. However, 19.4% of respondents were influenced to eat the fruits either by hunger or rebel commanders during food shortage. The knowledge and consumption of WFP are gradually reducing in the wake of increasing improved agricultural production technology and marketed food plants, eroded culture and tradition. There is need for thorough nutritional evaluation prior to recommendation of WFP for large scale consumption and marketing.*

Keywords: *Epistemology, diet, food security, nutrients, wild fruit species*

I. Introduction

The Acholi sub-region, in the northern part of Uganda, is an area with great biological diversity where people greatly depend on wild food resources for their subsistence, particularly on Wild Fruit Plants (WFPs). The importance of wild plants as food supplements and as a means of survival during times of drought and famine in the developing world is well acknowledged (Guinand & Lemessa, 2001). The consumption of a wide range of wild plant species is more common and widespread in areas of food scarcity. These plants termed as 'famine-foods', are consumed only at times of food stress and are therefore, an indicator of famine conditions (Guinand & Lemessa, 2001). The WFPs, which are also important to cultural identity, provide essential sources of nutrients and vitamin A, as well as much seasonal dietary variety. Wild fruits play essential roles in food security, human health and nutrition, and economic welfare of rural communities in the developing world (Saka *et al*, 2007). Many wild fruits and nuts are good sources of carbohydrates, protein, fat, vitamins, and minerals that may be deficient in common diets (Saka *et al*, 2007).

Despite the great emphasis being laid recently on the role of wild fruits in the health and nutritional status of the people, increased consumption is limited to the rural communities and particularly during periods of food insecurity. Nevertheless, most of the wild fruits have a good proportion of some nutrients and bioactive ingredients, and can make a significant contribution to daily nutrient intake, especially for the rural communities and those of low social classes. Additionally, traditional food constitutes an essential aspect of cultural heritage and they are highly regarded by the community (Musaiger *et al*, 2000). Despite lack of scientific knowledge, many local peoples understand the benefits of wild fruits in maintaining their culture and in health promotion.

During the decade long rebellion in northern Uganda, a total of about 25,000 children were abducted and while in the bush, they were frequently starved and consumed wild fruits. Consumption of wild food plants was one of the important local survival strategies because of food scarcity in the bush and the abundant villages. Increased consumption of wild food plants enabled abductees and the people of the Acholi sub-region survive marginally with erratic conditions for several consecutive years (Amone, 2005). Although wild fruits offer numerous benefits to the communities in the Acholi sub-region, little documentation is available on the current diversity and nutritional status of wild fruits in the sub-region. The study was therefore conducted to determine

the diversity and assess the nutritional content of mostly consumed wild fruits in the Acholi sub-region, main focus being placed on the content of the major food values, major mineral and vitamin contents.

II. Methodology

The study was conducted in Acholi sub-region, northern Uganda in the districts of Amuru (2°49'07.0"N, 31°51'51.0"E), Gulu (02 45N, 32 00E), Kitgum (3°17'20.0"N, 32°52'40.0"E) and Pader (02 50N, 33 05E). Data on fruits species, diversity, habitat, mode of growth and consumption, taste and epistemology of their consumption were collected using structured questionnaires, semi-structured interviews, direct field observations and focused group discussions. A total of 206 respondents, which included formerly abducted children (FAC) and district officials were used for the study in two sub-counties from each district.

Samples obtained for analysis were representative of fruits typically consumed by group members and reflected a significant number of fruits eaten by the people. Prioritizing fruits was necessary to generate information on the most commonly consumed plants which were chosen for nutritional analysis. Therefore, only 10 highly prioritized wild fruit species were considered for the analysis. To describe commonly eaten plants, it was assumed that the familiarity with which a given fruit species was held was equivalent to its frequency of consumption. Familiarity index (Fi), as used by Tabuti (2003), was adopted to show relative indicator of the popularity of any given edible wild fruit species within the FAC. Fi was calculated by using the formula:

$$Fi = \frac{\text{Frequency a given species is mentioned as eaten} \times 100}{\text{Total number of respondents}}$$

The selected fruits *Tamarindus indica*, *Ziziphus sp*, *Passiflora edulis*, *Vitellaria paradoxa* were then analyzed to determine their nutritional contents using procedures of AOAC (1990).

III. Results

Demographic characteristics of respondents

Most respondents who had knowledge, collected and consumed wild fruits were adults between 40-49 years (Table 1). More males collected and consumed wild fruits than females. Most respondents who collected and consumed wild fruits had no formal education followed by those who stopped at primary level.

Table 1: Demographic characteristics of respondents

Characteristics	Number of respondents (n = 206)	% of respondents
Gender		
Male	139	67.5
Female	67	32.5
Age		
10-19	8	3.88
20-29	14	6.80
30-39	16	7.77
40-49	91	44.2
50-59	49	23.8
60-69	18	8.74
70-79	4	1.94
80-89	6	2.91
Education level		
Never went to school	88	42.7
Primary	61	29.6
Junior	25	12.1
Secondary	24	11.7
Tertiary	8	3.9

Most respondents were males signifying a very significant implication on the knowledge, collection and consumption of wild fruit plants in Acholi sub-region. Males were also the major consumers of wild food plants and consequently had more knowledge of wild fruit plants than their female counterparts. This was because males usually moved to forests for building materials and rangeland to look after livestock, and in the process, they encountered, collected and consumed wild fruit plants. Reyes-Garcia, *et al* (2005) similarly reported that males spent more time wandering around the village and playing outside with friends and at the same time collected and consumed wild edibles such as fruits on the spot. However, the proportion of young males collecting and consuming wild fruit were higher than older males. The high proportion of young males could be due to their ability to easily forage and climb trees for collection of wild fruits. It is also probable that young males ate more wild fruits not only to satisfy their additional sustenance needs but also there existed a traditional obligation and social group pressure (from the end of childhood to the beginning of teen age) to

collect and eat wild fruits together with age mates. Small proportion of females was involved because they stayed at home most of the time but only collected wild fruits on their way to: fetch water, collect firewood, the market and when walking home from gardens. However, these activities were reducing because water points were brought nearer to homesteads and fruit trees were being cut down. The division of labour related to gender in gathering and hunting of wild fruit resources was also reported by Wetherilt (1992).

Both illiterate and literate people were recorded to be collecting and consuming wild food plants confirming the informal ways of indigenous knowledge. The continued reliance on wild food plants could be attributed to the deep socio-cultural bondage, poor harvests of cultivated crops and strategy to survive through periods of food stress. Cultural factors have been found to play a significant role in the continued reliance on wild food plants (Wetherilt, 1992).

Diversity of wild fruit plant species, growth habit, parts eaten, preparation and taste

Twenty six wild fruit plant species were identified (Table 2). Trees constituted the most common form of fruit plant species as compared to herbs. Four fruit plant habitats were identified where woodlands dominated other habitats. Among the edible parts, fruits were most widely eaten than seeds. The fruits were consumed mainly in raw form and thus required less preparation process. The taste of fruits or seed varied from sweet through sour, bitter to mild but the taste also depended on additives such as salt. Structure of some fruit plant species are shown in Figure 1.

Diversity of wild fruit plant species

The flora of the Acholi sub-region is rich and provides diverse and useful wild food plants species. Out of 51wild food plant documented, Anacardiaceae and Tiliaceae families had the highest proportion of edibles with 5 species each. The growth forms of the plant species included shrubs, trees, herbs and climbers. Shrubs and trees made up the highest proportion of the wild food plant species collected. Fruits, leaves, and seeds were the parts used widely by the communities. Edibility of these species over wider areas among different communities indicated the existence of common knowledge across a range of subsistence groups of similar culture and different geographic areas. In comparison, Amuru and Gulu districts shared more or less the same number of edible plant species. Sixteen species had been given similar names in the local language. The species used in common between the district communities may be attributable to the sharing of an overlapping ecological niches, culture and language. Interaction between communities through trade or due to proximity with one another might have over the years passed on the culture and knowledge on use of certain edible species to others. Nevertheless, the sharing of overlapping ecological niches by the people might sometimes compel any given two communities to compete for the dwindling wild edible plant resources in their overlapping ecological niches.

The marginal lands (savannah grassland), forest gaps and farmlands (traditional agro ecosystems) were important sources (habitats) of wild food plants and made important contributions to biodiversity conservation and food security. Wild food plants in traditional communal areas of the sub-region often grow on lands that extend from the immediate neighbourhoods of the built area of human settlements to the arable lands and grazing areas and at times in disturbed areas. Most useful wild-food herbs and tree species found on farmers' fields have not been purposely grown and domesticated in the proper sense. Farmers knew how to make use of indigenous tree species, but they had little knowledge about seed treatment and other propagation methods. Although most indigenous trees were not purposely planted and raised, farmers had knowledge of the usefulness of certain tree species. Therefore, if it so happens that a seedling (so-called wildling) germinates and grows somewhere on the farm, it will be nurtured and protected.

Mode of consumption of wild food plant species

Raw recipes predominated in the modes of consumption of wild food plants with 47% followed by cooked edibles (39%). Relatively high percentage of cooked edibles may be attributed to the change of the socio-economic context of rural areas. Nowadays, people do not spend as much time in the natural environment as they used to do in the past in order to consume raw vegetables. Consumption is influenced by contemporary dietary trends of cooked food and edible plants collected from the wild. A number of wild food plants had multiple parts eaten. The current study revealed a group of wild-food plants called multipurpose wild food plants where fruits plus one or more additional food products such as leaves and tender parts of stalks and/or root parts could be used at different times of the year and at different stages. *Balanites aegyptiaca* (*Too* in Acholi), an ever green tree, about 10 to 20 meters high was a typical representative of this category. Its fruits were eaten any time when ripe by children and adults in times of food shortage. The new shoots, which always grow during the dry season, are commonly used. People cut the newly growing succulent shoots and leaves and cook them like cabbage. The seed coats are also broken, seeds roasted and oil for cooking is processed out of it. Other plants consumed in similar manner are *Physalis peruviana*, *Solanum nigrum*, elephant tree (fruits*).* Most

of the edible fruits and seeds are collected and immediately used by children or adults. Such foraging activities provide essential supplies of vitamins and minerals particularly to children.

Table 2: Wild fruit plant species, growth habit, parts eaten, preparation and taste

Local name	Family	Species (n=26)	Habitat	Habit	Part Eaten	Preparation	Taste
Awaca	Anacardiaceae	*Rhus pyroides var pyroides* Burch.	Woodlands	Tree	Fruits	Raw	Sweet
Obwolo mumu	Annonaceae	*Annona Chrysophylla* Pers.	Woodlands	Tree	Fruits	Raw	Sweet
Obwolo	Annonaceae	*Annona senegalensis* Pers	Woodlands	Tree	Fruits	Raw	Sweet
Acuga	Apocynaceae	*Carissa eduli* (Forssk.) Vahl.	Forest edge	Tree	Fruits	Raw	Sour
Tugu	Arecaceae	*Borassus aethiopum* Jacq.	Grasslands	Tree	Fruits/shoot	Raw	Sweet
Ogudu	Asparagaseae	*Asparagus africanus* Lam.	Forest	Herb	Fruits	Raw	Sweet
Ogele	Cactaceae	*Opuntia vulgaris* L.	Grassland	Tree	Fruits	Boiled	Mild
Cwaa	Caesalpiniceae	*Tamarindus indica* L.	Woodlands	Tree	Fruits	Raw	Sour
Ogali	Ceasalpinoideae	*Psiliostigma thoningii* Egglings.	Woodlands	Tree	Fruits	Raw	Sour
Cumu	Ebenaceae	*Diospyros mespiliformis* Egglings.	Forest	Tree	Fruits	Raw	Sweet
Ayuu	Euphorbiaceae	*Euphobia hirta* Eggling.	Woodlands	Tree	Fruits	Raw	sweet
Lacu	Euphorbiaceae	*Phyllanthus Floribundus* Muell	Grassland	Tree	Fruits	Raw	Sour
Olwaa	Loganiaceae	*Strychnos innocua* Egglings.	Woodlands	Tree	Fruits	Raw	Sweet
Aloga	Mimosaceae	*Albizia grandibracteata* L.	Forest edges	Tree	Fruits	Raw	Sweet
Olelemo	Olecaceae	*Ximenia americana* L.	Forest edge	Tree	Fruits	Raw	Sweet
Lamoyo	Papilionaceae	*Dolichos trilobus* L	Grassland	Herb	Seeds	Boiled	Mild
Kwomu	Passifloraceae	*Passiflora edulis* (Forsk.) Vahl	Forest gaps	Tree	Fruits	Raw	Sour
Odwong	Rubiaceae	*Gardenia termifolia* K. Schum	Woodlands	Tree	Fruits	Raw	Bitter
Ibele	Rubiaceae	*Canthium burtii* (Hook). Skeels	Garden	Herb	Fruits	Raw	Sour
Yaa	Sapotaceae	*Vitellaria paradoxa* (Gaertn.f.) Herper	Woodlands	Tree	Fruits	Raw	Sweet
Too	Simaroubaceae	*Balanites aegyptiaca* (L.) Del.	Woodlands	Tree	Fruits/Leaves	Raw	Sweet/Bitter
Ogwal gongo	Solanaceae	*Physalis peruviana L.*	Forest gaps	Herb	Fruits	Raw	Sour
Pobo alwala	Triliaceae	*Grewia mollis* Juss.	Woodlands	Tree	Fruits/Leaves	Raw	Sweet/mild
Pobo acol	Triliaceae	*Grewia conocarpoids* A.Rich	Woodlands	Herb	Fruits	Raw	Sweet
Larwece	Triliaceae	*Niomniamensis* L.	Woodlands	Herb	Fruits	Boiled	Sour
Opobo	Ulmaceae	*Trema orientalis* Egglings	Forest	Tree	Fruits	Raw	Sweet

Diospyros Mespiliformis

Carissa Edulis

Hoslundia Opposite

Psychostachys Niomniamensis

Ficus sp

Vitex doniana

Trema orientalis Passiflora edulis

Figure 1: Structure of some wild fruit plant species

Nutritional composition of wild fruits used for human consumption

Nutrient composition varied among different wild fruit species (Table 3). Except for *Vitellaria paradoxa*, the wild fruit species were richer in vitamin C and sugar. However, *Vitellaria paradoxa* recorded the highest protein and fat contents while phosphorus and zinc were highest in *Passiflora edulis*. High sugar content in most wild fruit species indicated that they could be used as energy source for humans especially in periods where conventional energy feedstuffs such as maize were scarce. The study revealed that wild food plant species had a very high nutritional potential, and their nutritional values was greater than that of some green cultivated crops. With respect to their mineral contents, these wild plants may offer a better nutritional potential. For instance *Tamarindus indica* and *Passiflora edulis* contained the highest concentration of ascorbic acid which is only comparable to oranges (270g/100g). All species tested showed the highest abundance of Fe and vitamin C. Splittstoessr (1990) reported that 60 mg vitamin C, 750 mg P and 10 mg Fe are required daily by humans. Therefore, 254 mg *Tamarindus indica* and 250 g *Passiflora edulis* could meet the daily recommended vitamin C, Fe, and P requirements. *Passiflora edulis* with dietary fiber of 38.27 mg/100g could play an important role in decreasing the risks of many disorders such as constipation, diabetes, cardiovascular diseases, diverticulosis and obesity (Spiller, 2001).

Vitellaria paradoxa had the highest fat content. Fats and oils provide more calories/gram than any other nutrient and allow for the absorption of vitamins A, D and E (Gullick, 1997). Many wild fruits contain kernels, which are rich in lipids and from where substantial quantities of oil can be extracted for cooking purposes. The high fat foods are particularly important for children who need the energy-dense foods for growth. Wild grains, seeds and kernels provide significant amounts of calories, proteins and oils (BOSTID, 1996). The calorific values of wild grains are frequently greater than those of the cultivated varieties and they tend to be more balanced than cereals when the overall nutritional value is taken into consideration (BOSTID, 1996).

Table 3: Nutrient content of wild fruit plant species (DM basis)

		Species		
Composition	*Passiflora edulis*	*Vitellaria paradoxa*	*Ziziphus abyssinica*	*Tamarindus indica*
Dry matter (%)	86.3	90.0	93.2	90.8
Crude protein (%)	3.60	5.01	3.82	2.62
Ether extract (%)	0.530	2.75	0.340	0.22
Crude fibre (%)	38.3	15.9	9.78	28.1
Sugar (%)	7.87	2.43	6.62	5.82
Phosphorus (mg/100g)	51.7	23.6	24.2	37.9
Zinc (mg/100g)	61.0	5.50	5.60	7.10
Iron (mg/100g)	4.32	4.82	5.03	7.12
Vitamin C (mg/100g) (10^2)	2.50	0.143	1.00	2.54
Vitamin A (mg/100g)	67.4	21.5	56.3	70.2

Fruits, particularly those consumed raw, all contain vitamin C, and a lack of this vitamin can cause scurvy. The vitamin content of *Passiflora edulis*, *Tamarindus indica* and *Ziziphus sp* were higher than that of orange, which has 57 mg/100g (KENGO, 1988) When people become ill in most parts of the study area, especially in Kitgum district, it was a common practice to increase consumption of fruits or fruit juices such as *Tamarindus indica*, *Ziziphus sp.* The people believe that wild fruits help them recover from illness. Vitamin C helps the body to use calcium, to absorb non-haeme iron (derived from plants, eggs and milk) and destroys free radicals (KENGO, 1988). Interestingly, scurvy does not normally appear in breast feeding infants because of their intake of ascorbic acid from their mother's milk, which normally contains three times more ascorbic acid

than that of infants fed a similar amount of other milks (KENGO, 1988). Certainly, in Acholi sub-region, this highlights the importance of the older children bringing fresh fruits back home for the rest of the family, particularly for the weaning mothers. The iron content of *Tamarindus indica* fruit was comparable to the 4.2-45.6 mg/100g reported in the fruit by Ogle and Grivetti (1985).

Knowledge acquisition of wild food plant consumption

The knowledge of wild fruit consumption was mainly informal, acquired from the parents, grandparents and friends (Table 4). However, 19.4% of respondents were influenced to eat the fruits either by hunger or rebel commanders during food shortage. A number of plants have been collected and consumed as wild food for a long time. The benefits of these plants to the rural communities in Acholi sub-region cannot be ignored. The current study clearly indicated that the knowledge, collection and consumption of wild fruit plants were more common with older people above 40 years (Table 1). This poses risk of losing the knowledge on wild fruits since most elderly die off leaving a few still alive. Therefore, there is urgent need to equip the young with knowledge of wild food plants for sustainability purposes. This is possible if the primary level curriculum would involve the component of wild food plant for human consumption. At this level, children are still with their parents at home; started to learn about gathering wild food plants at the age of 7 when taken into the field and joining in the collecting trips with adults. At the age of 10-12, children will have gained a large part of knowledge of wild fruits. At the same time, grandparents become less active in gathering and hunting activities as they grow older.

Table 4: Sources of knowledge on the consumption of wild fruit plants

Knowledge source	No. of respondents (n = 206)	% of respondents
Parents and grandparents	58	28.2
Saw friends eating	45	21.8
Knew and ate it before	34	16.5
Just ate because of hunger	22	10.7
Forced to eat by rebel commanders	18	8.74
Told by a friend	14	6.80
Class teacher taught about it	7	3.40
Trial and error/self-discovery	6	2.91
Read about it from books	2	0.971

The elderly persons explained the change in consumption of wild fruit as an on-going process of "change of tastes" in younger generations towards market foods as new status symbols. Acquisition of new tastes; feeding attitudes, and adoption of new status symbols have been reported (Reyes-Garcia, 2003; Lewis, 2004). Lewis (2004) called it ‘‘gustatory subversion’’ which refers to the introduction of exotic foods that have the effect of subverting local cuisine, resulting in a low quality diet and economic dependence.

Reyes (2003) reported that people gain traditional knowledge of wild food resources through their life experience. The specific local context of culture, society, economy, and bio-physical-environment are important elements in the kind of knowledge children gain. Additionally, traditional knowledge acquisition is from the interactions with family members and other members of the community (Guinand and Lemessa, 2001). Most respondents acquired knowledge of wild food plants from parents/grandparents probably because these were the main caretakers of children. Grandfathers teach techniques in acquiring wild food plants which are hunted and collected by men. This knowledge transmission was basically passed orally and consisted of observation, participation and practice. Other studies have reported that traditional knowledge is largely transmitted vertically where parents and grandparents are the main contributors in knowledge transmission (Lejoly, 1996; Reyes-Garcia, 2003).

Children who saw their friends eat wild food plants were one of the most important ways of knowledge transmission. It could also be possible that, during collecting trips with other children, knowledge was shared and learned among them. The children, especially at the ages of 10-12, were observed to be a crucial channel of knowledge acquisition; gathering and hunting activities often combined with play and wandering around in the surroundings in bands with other children (Rogoff 1981; Cruz, 2006). Skill and mastery of wild food plant collection and consumption depend mainly on the frequency of practice and the amount of contact with transmitters within the specific context. Children see these natural foods, they eat them, and they hear others talk about them, so they learn what they are called. Another element of WFP knowledge is a technical element, which is practical skill knowledge and mastery (Rogoff 1981; Cruz, 2006). This element is even more crucial for local people in that they apply it to acquire their foods from nature.

IV. Conclusions

Acholi sub-region, Uganda has a large number wild food plants which if sustainably utilized can enhancing dietary and food security for the people. Knowledge of the edibility, habitat, distribution, harvesting time and uses of most wild food plant species is still maintained among the study communities because of continued reliance of local communities on the wild food plants. Most of the edible plants are mainly consumed by children and poor families both during normal and food shortage. Utility of the wild food plants especially by younger community members ensures the maintenance of indigenous knowledge associated with the species. The decline in use of some famine edible species may gradually lead to the fading away of the indigenous knowledge associated with the plants. The increasing availability of processed market foods accompanied by newly acquired tastes by the children may also be a contributing factor to loss of knowledge of wild food plants. Gathering and consuming less may ultimately bring about a further erosion of knowledge for some species in the future.

Edible wild plants made a major contribution to dietary intake of rural people during times of food shortage. Consumption of wild plants was a necessary part of the strategies adopted by people in order to survive in the harsh environment. Some of the wild plants used locally for consumption at times of food shortage, have the potential to become valuable staple foods and important alternatives to the usual food crops cultivated by farmers.

References

[1]. **Amone-P'Olak K. *(2005)***. Psychological impact of war and sexual abuse on adolescent girls in Northern Uganda. *Intervention*, 3, 33-45.

[2]. **AOAC (1990).** Method of Analysis. Association of Official Analytical Chemists, Official Methods of Analysis, 15th Edn. Washington, D. C. 1(9) CFR 318.19b.pp.69-84.

[3]. **Cruz G.(2006).** The mother-child nexus. Knowledge and valuation of wild food plants in Wayanad, Western Ghats, India. Journal of Ethnobiology and Ethnomedicine. 2006;2:39. doi: 10.1186/1746-4269-2-39. [PMC free article] [PubMed] [Cross Ref]

[4]. **Guinand and Lemessa, D. (1999).** *Field Assessment Mission Report*. Wolayita, North Omo Zone. UN-EUE Field Mission Report, 17 to 21 August 1999, Addis Ababa.

[5]. **Gullick, (1997).** Characterization of chimeric proteins constructed from human epidermal growth factor (EGF) and the Drosophila EGF-receptor antagonist argos Pages: 1997; 677-682 DOI: 10.3892/ijo. 10.4.

[6]. **Lejoly, J., (1996).** Synthèse régionale sur le biodiversité des ligneux dans les sites du projet ECOFAC en Afrique Centrale. Groupement AGRECO-CTFT. Libreville. Gabon Lost Crops of Africa: Volume 1 - Grains (**BOSTID**, **1996**, 372 p.) VIEW THE DOCUMENT, (introduction...) VIEW THE DOCUMENT, Notice.

[7]. **Musaiger, A. O., Ahmed A. and Rao, M. R. (2000).** Nutritional value of Traditional sweets consumed in the Arab Gulf countries. Int. J. Food Sci. Nutr., 51: 403-408.

[8]. **Ogle, B. M. and Grivetti, L. E. 1985.** Legacy of the chameleon edible plants in the Kingdom of Swaziland, South Africa: A cultural, ecological, nutritional study. Parts II – IV, species availability and dietary use, analysis by ecological zone. Ecology of Food and Nutrition 17: 1–30

[9]. **Reyes-Garcia, V., Vadez, V., Huanca, T., Leonard, W. and Wilkie, D. (2005)**. Knowledge and consumption of wild plants: A comparative study in two Tsimane villages in the Bolivian Amazon. Ethnobotany Research and Applications 3: 201-207

[10]. **Rogoff B. 1981.** Children's traditional ecological knowledge of wild food resources: a case study in a rural village in Northeast Thailand. Ethos. 1981;9:18–36. doi: 10.1525/eth.1981.9.1.02a00030.(Cross Reference)

[11]. **Saka, J., Rapp, I., Akinnifesi, F., Victoria, Ndolo, V. and Mhango J. (2007).** Physicochemical and organoleptic characteristics of Uapaca kirkiana, Strychnos cocculoides, Adansonia digitata and Mangiferia indica fruit products. Int. J. Food Sci. Technol. 42: 836-841.

[12]. **Splittstoesser WE (1990).** Vegetable Growing Handbook.Westport: Avi Publishing Company Inc.

[13]. **Spiller, A. (2001)**. Preispolitik für ökologische Lebensmittel: Eine neoinstitutionalistische Analyse.Agrarwirtschaft,50 :451- 461.

[14]. **Tabuti, J. R .S., Dhillion, S. S. and Lye, K.A. (2004).** The status of wild food plants in Bulamogi County, Uganda. In. J. Food Sci. Nutr., 55: 485-498

[15]. **UNICEF, & WHO. 2005.** *Update report on malnutrition in Northern Uganda January to July 2005*.

[16]. **Wetherilt H (1992).** Evaluation of Urtica species as potential sources of important nutrients. Food Science and Human Nutrition 29: 15- 26.

[17]. **The New Vision, October 6th 2005**. Webb, P. & von, B. J. 1994. Famine and Food Security in Ethiopia; Lessons for Africa. The International Food Policy Research Institute, Chichester.