The nutritive value of traditional processed and stored indigenous Vegetable Chipali in Dodoma region, Tanzania.

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Abstract

The nutritive value of Chipali (Ipomea obscura) an indigenous vegetable in Dodoma region and the effect of traditional processing on the nutrients contents were determined by AOAC methods. The results of this study indicated that crude protein, fat, fibre, ash, carbohydrate and moisture content of fresh Chipali were 3.60, 2.50, 2.11, 2.59,3.42, and 85.78%, respectively. The mineral content of fresh Chipali were 336.0, 180,165.0,26, and 540.0 mg/100kg for K, Na, Mg, Fe, and Ca, respectively. The ascorbic acid content of the fresh vegetable was 11.35mg/100g. Traditional processing of Chipali resulted into loss of 19.72, 62.4, and 32.6% for crude protein, fat and ascorbic acid content respectively. However fibre and ash content were slightly affected by processing . Further loss of ascorbic acid of about 92.5% was observed after 6 weeks of storage. Processing of the vegetable reduced the mineral content by 4.46, 6.11,5.45,42.31 and 24.07%, for K, Na, Mg, Fe and Ca, respectively. Traditional processing and storage of processed Chipali resulted in significant ($P < 0.05$) decreased in all the nutrients. Based on the results of this study the use of traditional processed Chipali is likely to contribute to the poor nutrition of the rural population in Dodoma region unless otherwise supplemented with other locally available source of nutrients such as groundnuts and meat.

Key words: Ash, Ascorbic acid, Carbohydrates, Crude protein, Fat, Fibre, Mineral.

Introduction.

The importance of green leaf vegetables as a sources of nutrients in societies where consumption of animal based food products is low is well recognised (FAO, 1988) Green leafy vegetables and certain fruits are important sources of pro-vitamin A, carotenoids, ascorbic acid, riboflavin, minerals and other nutrients (Uiso and Manhunnah, 2000). Traditional, societies have been able to maintain adequate nutritional status through a wide variety of food staples together with wild leafy vegetables and fruits (Grivetti, 1978; Ogle & Grivetti, 1985). Some fruits, roots and leafy vegetables are consumed routinely, while many species are of importance only during times of seasonal shortages or drought (Grivetti et al., 1987). The use of a wide variety of vegetables, even though they are low in amount of protein tend to complement each other in amino acids and leads to overall adequate protein intake (Ogle & Grivetti, 1985). Some of the indigenous food plants encountered in household gardens as weeds and wild plants are not only nutritious but are also strategic reserves of essential nutrients that are available at certain critical periods of the year when other more common sources of these nutrients are scarce or completely unavailable (Lockett et al., 2000 & Okigbo 1977). The indigenous vegetables in Tanzania includes mchicha (amaranth), majani ya kunde (cowpea leaves), majani ya maboga (pumpkin leaves), mnafu (nightshade), matembele (sweet potato leaves), mgagani (spider flower), kisamvu (cassava leaves), ngogwe (African eggplant), mlenda (chochorne) and sukuma wiki (African kale) (FAO, 1973). These vegetable forms an essential component of the meal and contribute significantly to dietary requirements for nutrients such as Ca, Fe, Mg, Zn, ascorbic acid, riboflavin, thiamine, fibre and protein especially in areas of low animal protein availability and where cereals comprise most of the human diet (Lyimo et al., 1991; Maeda & Salunkhe, 1981). Green leafy vegetables are consumed on a daily basis, normally as a relish to accompany starchy foods such as maize, rice and sorghum (Anne, 1989). Apart from the contribution of valuable nutrients, vitamins and mineral vegetables are known to add variety of taste, colour and texture to diets (Rubartzk & Yamaguch, 1996).

In many areas of the world, edible vegetation is not utilised due to lack of information, some taboos, or personal preferences. Sometimes only when faced with starvation is when some population resort to consuming vegetative crops or plants, (Rubatzky & Yamaguchi, 1996). Chipali is one of the indigenous non-cultivated consumed by the native people of Dodoma region. It is a weed plant of the sweet potato family Ipomea obscura. It grows in rural areas in Dodoma and it is abundantly available during the rainy season and scarce in the dry season. To alleviate shortage of this during the dry season it is traditionally processed and stored in gourds for use during off season.

Considering the widespread nutrient deficiency problems and the important role green leafy vegetables play in human nutrition as reported in dietary surveys in Tanzania, this study was undertaken to assess the nutritive value and the effect of traditional processing on the nutrient composition of Chipali.

Materials and Methods

Samples collection and preparation
Fresh and processed Chipali leaves was collected from Mvumi village, Dodoma region. The processed Chipali was collected in traditional storage containers (gourds) while fresh Chipali was collected in black coloured polythene bags to avoid exposure of the vegetable to light, which could lead to loss of some light sensitive vitamins. The processing of Chipali in the village involved picking the Chipali leaves, washing in water and cutting into small pieces and pounding them using pestle and mortar to form thick paste. The thick paste was made into pancake like forms and then sun dried. Once fully dried they were stored in special traditional containers (gourds) for future use.

Proximate composition, mineral and vitamin analyses.
Proximate composition of Chipali was determined using standard methods (AOAC, 1990). The moisture content was determined by drying using an air oven (WTC Binder, type E115 RWF 12/5) at 130°C for 1 h (method 14,004). Crude protein by the micro-Kjeldahl method using 6.25 as the conversion factor (method 14.063). Crude fat was determined by ether extraction using the Soxhlet extraction. The crude fibre by dilute acid and alkalis hydrolysis (method 7.054). Ash content of Chipali (Ipomea obscura) was determined by combusting 2g samples in a muffle furnace (Carbolate type RWF 12/5, Sheffield, England) at 550°C to constant weight (method 14.006). Ashes samples were transferred to a desiccator to cool and weight recorded. Carbohydrate was calculated by different. Ascorbic acid (vitamin C) was determine by 2, 6-dichlorophenolindophenol visual titration method (AOAC, 1990) Potassium, magnesium and iron were determined by atomic absorption spectrophotometer while calcium and sodium by flame photometry method (AOAC, 1990).

Results and discussion

Table 1 presents the nutrient composition of fresh, processed and stored Chipali. A significant variation in the content of moisture, crude protein, fat, carbohydrates, and vitamin was observed between the fresh, processed and stored Chipali. The content of ascorbic acid (vitamin C) of the fresh Chipali leaves (11. 36 mg/100g) was less than that of most leafy vegetables reported in other studies (Lyimo et al. 1991). Mosha et al., (1995) and Mosha et al., (1997) reported that the low value of Vitamin C could be due to unsuitable environmental conditions such as climate, soil and cultural practices. However, there was a significant ($P<0.05$) decrease of vitamin C after processing and during storage which could be attributed to oxidation of the vitamin. Processing and during storage which could be attributed to oxidation of the vitamin. Processing and sun-drying resulted in a significant ($P<0.05$) decrease in all the nutrients. The decrease was 19.72 and 62.40% for protein and fat content, respectively. The loss of crude protein during processing and storage of the vegetable can be explained by the fact that protein is easily denatured by heat (Salunkhe, 1974). There was a significant ($P<0.005$) variation in ascorbic acid during processing and storage. A loss of about 32.60% was experienced during processing and sun-drying. There was a further loss of about 92.80% at the end of six weeks storage.

The loss of Vitamin C content in the vegetable could be due to the fact that drying of the vegetable under sunlight without shade allows light to come in contact with the vegetable and enhance vitamin C destruction. Vitamin C may also be lost through leaching out as it is water soluble (Lyimo et al., 1991). Also uncontrolled temperature and oxygen availability accelerates the rate of vitamin C destruction by oxidation (Maeda, 1977)

Table 2 shows the mineral concentrations (mg/100g) for fresh, processed and stored Chipali. The iron content of

Table 1. The nutrient composition of fresh, processed and stored Chipali[1,2]

Treatment	Moisture %	Protein %	Fat %	Fibre %	Ash %	Carbohydrate %	Vitamin C mg/100g
Fresh	85.78±0.36[a]	3.60±0.49[a]	2.50±0.02[a]	2.11±0.40[a]	2.59±0.02[a]	3.42±0.74[a]	11.35±0.21[a]
Processed	10.80±0.18[b]	2.89±0.34[b]	0.94±0.06[b]	2.01±0.01[b]	2.56±0.02[b]	82.06±0.34[b]	7.65±0.00b
Storage							
Weeks 2	10.70±0.18[b]	2.87±0.85[b]	0.70±0.11[c]	2.00±0.01[b]	2.55±0.04[b]	82.37±0.73[b]	6.03±0.12[c]
Weeks 4	10.63±0.16[b]	2.85±0.72[b]	0.67±0.07[c]	2.00±0.07[b]	2.55±0.07[b]	82.38±0.74[b]	3.24±0.12[c]
Weeks 6	7.05±0.19[c]	2.84±0.42[b]	0.48±0.08[c]	1.98±0.29[b]	2.55±0.06[b]	86.23±0.48[b]	0.54±0.11[c]

[1] Means within a column with different superscripts are significantly different using Duncan's Multiple Range Test at $P<0.05$

[2] Mean# standard errors based on three observations.

fresh Chipali (Ipomea obscura) as per results of this study is 2.6mg/100g. This value is similar to that of other vegetables of the same family such as Ipomea aquatica (2.5mg/100g) as reported by Tindal (1983). There was no significant (P>0.05) variation of iron content during processing and storage for six weeks. However, significant (P<0.05) variation was observed in the rest of the minerals. The values for Ca, Na, Mg, and K were higher than the ones obtained in other studies for different vegetables (Lyimo et.al., 19912). Mosha et al.,

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Table 2 Mineral concentrations (mg/100g) in fresh, processed and stored Chipali[1,2]

Treatment	Potassium	Sodium	Magnesium	Iron	Calcium
Fresh	336.0±0.85[a]	18.0±0.17[a]	165.0±0.37[a]	2.6±0.02[a]	540.0±0.38[e]
Processed	321.0±0.49[b]	16.9±0.18[b]	156.0±0.19[b]	1.5±0.01[b]	410.0±0.34[d]
Storage					
Weeks 2	260.0±0.42[c]	17.3±0.11[b]	113.0±0.45[c]	1.3±0.06[b]	330.0±0.16[c]
Weeks 4	258.0±0.53[c]	16.3±0.08[c]	106.0±0.26[d]	1.3±0.04[b]	325.0±0.87[b]
Weeks 6	255.0±0.79[d]	15.4±0.09[d]	98.0±0.45[e]	1.2±0.05[b]	322.0±0.24[a]

[1] Means standard errors based on three observations

[2] Means within a column with different superscripts are significantly different using Dancan's Multiple Range Test at P<0.05)

The variation in the mineral content during processing and storage could be due to leaching effect during washing of the vegetable. Processing decreased the mineral content of fresh Chipali by 4.46%, 6.11%, 5..45%, 42.31% and 24.0% for K, Na, Mg, Fe and Ca, respectively.

Based on these results fresh Chipali (Ipomea obscura) proved to be a rich source of minerals such Na. K, Mg, Ca Fe, protein, fat, fibre and carbohydrates. However, the nutritive value of the vegetable decreased when traditionally processed and stored for an extended period of time in the traditional containers (gourds). To minimize the losses of vitamin C (ascorbic acid) and other nutrients of the vegetable during processing and storage it is important during sun drying the vegetable is not exposed directly to sunlight. Drying should be done under shade or the vegetable should also be stored in air tight containers to avoid the effect of oxidation. To restore the lost nutrients supplementation with locally available source of nutrients such as groundnuts and meat is recommended. Although improved solar drying technology already exists which is in many ways superior to the traditional drying technology its adoption in Dodoma region has lagged behind. Hence efforts to promote the solar drying technology in Dodoma Region needs to be intensified. This cheap drying technology should go hand in hand with improved storage structures that leads to more attractive, nutritious and hygienic dried vegetable products.

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