# Iron and Protein Content of Priority African Indigenous Vegetables in the Lake Victoria Basin

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# Iron and Protein Content of Priority African Indigenous Vegetables in the Lake Victoria Basin

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**Abstract:** African indigenous vegetables have many nutritional and health benefits that have not been well researched and fully exploited. The objective of this study was to determine iron and protein contents of seven priority African indigenous vegetables found in Eastern Africa. The vegetables were planted at two sites, Maseno University, Maseno in western Kenya and Jomo Kenyatta University of Agriculture and Technology (JKUAT), Juja in Central Kenya between 2006 and 2008. These vegetables were organically grown and edible parts of each of the vegetable harvested during vegetative growth stages just before onset of flowering and analysed for iron and protein contents. Nightshade and cowpea had high levels of both iron and protein. Pumpkin leaves and amaranths had high iron content while spiderplant and slenderleaf had high protein levels. Both iron and protein levels differed significantly between the seven vegetables at both sites. Nightshade and cowpea contained iron and protein levels that would provide 100% of the recommended daily allowance (RDA) iron and 50% of recommended daily allowance protein for optimal human growth and health. These results help to demonstrate the nutritional value of African indigenous vegetables and their potential use in nutrition intervention programs.

**Key words:** Hidden hunger, nutrition security, vegetables.

## 1. Introduction

Over 60% of the populace of the Lake Victoria region live below the poverty line, with serious food insecurity problems resulting in malnutrition, poor health and inadequate basic necessities (African Institute for Capacity Building in African Development) [1, 2]. Eighty percent are food poor and 20-30% of the children under five years of age are malnourished. Malnutrition is normally manifested in various forms in children, such as their being underweight or stunted, or suffering from iron-deficiency anaemia, normally. The most serious malnutrition problems are a result of inadequate consumption of micronutrients normally referred to as hidden hunger [3]. These malnutrition problems are prevalent despite the fact that the Lake Victoria basin is endowed with agro-biodiversity African indigenous vegetables (AIVs) [4]. African indigenous vegetables have several advantages and potentials that are yet to be exploited [5]. These vegetables have been documented to be micro nutrient dense, have high content of anti-oxidants and they are adapted to the tropical environment. One of the major constraints that hinder optimal production and utilization of AIVs include lack of technical production and utilization packages, inadequate information on the micronutrient and protein contents [5]. Priority African indigenous vegetables identified and selected for their nutrition and economic potential in a study conducted between 2004 and 2006 in Kenya, Uganda and Tanzania included African nightshade (*Solanum scabrum*), vegetable amaranths (*Amaranthus blitum*), vegetable cowpeas(*Vigna unguiculata*), spiderplant (*Cleome gynandra*), pumpkin leaves(*Cucurbita moschata*), slenderleaf (*Crotalaria ochroleuca*) and jute mallow (*Corchorus olitorius*) and African kale

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(*Brassica carinata*) [6-8].

To ascertain the nutritional potential of African indigenous vegetables, a study was conducted in Kenya between 2006 and 2008 with the objective of determining iron and protein contents of seven priority African indigenous vegetables found in Eastern Africa.

## 2. Materials and Methods

The study was conducted in research plots at Maseno University in Western Kenya and at the farm of Jomo Kenyatta University of Agriculture and Technology (JKUAT) in Juja, central Kenya between 2006 and 2008. Seeds of African nightshade, vegetable amaranths, vegetable cowpeas, spiderplant, pumpkin leaves, slenderleaf and jute mallow were planted in well prepared seed beds using organic manure in completely randomised block design (CRBD). The edible parts of each of the vegetables were harvested during the vegetative growth stage just before flowering and analysed for iron and protein content using methods described by Association of Official Analytical Chemistry (AOAC) [9]. Data was subjected to analysis of variance to determine whether treatment effects were significant at 5%, 1% or 0.1%. Separation of means was done using $LSD_{5\%}$ to establish which treatment means were different from each other.

## 3. Results and Discussion

Results indicated that there were significant differences ($P \leq 0.05$) in the iron content of the vegetables and they ranged from 14.7 mg/100g fresh weight for slender leaf and 50.0 for pumpkin for the Maseno site and between 16 for cowpeas and slenderleaf and 50 mg/100g for pumpkin and nightshade for JKUAT site as shown in Table 1. The table also shows that iron contents found in all the vegetables contained over 70% and 80% of the recommended daily intake of iron for Maseno and JKUAT respectively. The observation that AIVs contain high iron content is in line with report of Abukutsa-Onyango [5] and Habwe et al [10]. Iron is important in the structure and function of red blood cells and deficiency leads to iron deficiency anaemia, a common health problem in many developing tropical countries. African indigenous vegetables could be used in alleviating this problem as they have higher iron content that can meet daily iron content than cabbage (*Brassica oleracea* var. *capitata*), a commonly consumed vegetable [5].

Table 2 shows that the protein content of indigenous vegetables differed significantly ($P \leq 0.05$) for both sites contributing 18-54% of the recommended daily intakes. Proteins are often deficient in diets in developing countries, this is especially so for nursing and expectant mothers, weanlings and pre-school children. The production and consumption of grain legumes which are always available to the rural population in the Lake Victoria region are encouraged, but African indigenous vegetables could be used to provide supple-

**Table 1 Iron content of priority African indigenous vegetables and percent contribution to recommended daily allowance (RDA).**

| Vegetable | Maseno University | | JKUAT | |
|---|---|---|---|---|
| | Iron (mg/100gfw) | RDA (%) | Iron (mg/100gfw) | RDA (%) |
| Nightshade | 26.4 | >100 | 50.0 | >100 |
| Amaranths | 16.0 | 80 | 20.1 | >100 |
| Spiderplant | 16.0 | 80 | 18.6 | 93 |
| Cowpea | 24.1 | >100 | 16.4 | 82 |
| Pumpkin | 50.0 | >100 | 50.1 | >100 |
| Slenderleaf | 14.7 | 74 | 16.5 | 82.5 |
| Jute mallow | 15.6 | 78 | 18.0 | 90 |
| $LSD_{5\%}$ | 8.6 | - | 7.4 | - |

**Table 2 Protein content of priority African indigenous vegetables and percent contribution to recommended daily allowance (RDA).**

| Vegetable | Maseno University | | JKUAT | |
|---|---|---|---|---|
| | Protein (g/100gfw) | RDA (%) | Protein (g/100gfw) | RDA (%) |
| Nightshade | 4.74 | 50 | 2.74 | 29 |
| Amaranths | 4.60 | 48 | 4.10 | 41 |
| Spiderplant | 4.54 | 48 | 4.80 | 51 |
| Cowpea | 4.80 | 51 | 4.30 | 43 |
| Pumpkin | 2.74 | 29 | 2.63 | 26 |
| Slenderleaf | 3.84 | 40 | 5.40 | 54 |
| Jute mallow | 4.50 | 47 | 1.75 | 18 |
| $LSD_{5\%}$ | 1.96 | - | 2.54 | - |

mentary protein and should be promoted and exploited.

It has been demonstrated that quality and nutitious products can be developed from AIVs like high iron simshade, simco and simama [11]. The high iron recipes developed from AIVs can alleviate iron deficiency anaemia in the Lake Victoria region and Africa at large. Development and formulation of nutritious recipes and products of indigenous vegetables found in East Africa will contribute to alleviating problems of malnutrition, loss of diversity and low income [10].

## 4. Conclusions

This study has revealed that 100 g fresh weight of the edible part of nightshade and cowpea contained iron and protein levels that would provide 100% of the recommended daily allowance (RDA) iron and 50% of recommended daily allowance protein for optimal human growth and health. These results help to demonstrate the nutritional value of African indigenous vegetables and their potential use in nutrition intervention programs.

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