

# Quality Assessment & Nutrient Analysis of Three Dried African Indigenous Vegetables

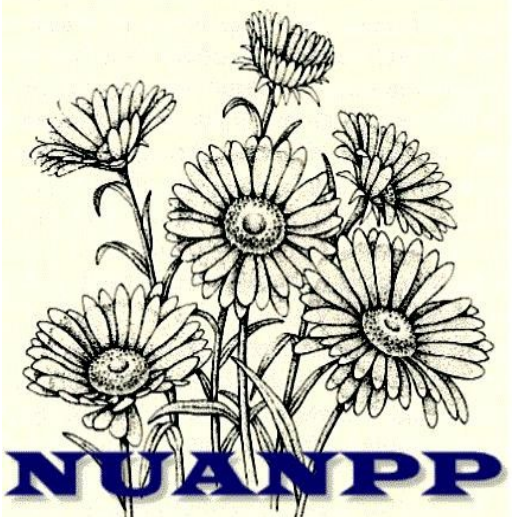
Emil van Wyk, David Byrnes<sup>1</sup>, H. Rodolfo Juliani<sup>2</sup>, Qingli Wu<sup>1</sup>, James E. Simon<sup>1</sup>

<sup>1</sup> New Use Agriculture and Natural Plant Products Program, Department of Plant Biology and Pathology, Rutgers University, New Brunswick, NJ 08901

<sup>2</sup> Department of Food Science, Rutgers University, New Brunswick, NJ 08901



RUTGERS



## 1. Introduction

The drying and packaging of leafy green vegetables is a novel post-harvest procedure making essential nutrients available beyond the growing season at an affordable price.

The objective of this report is to analyze three Kenyan products for quality control parameters such as moisture, ash, acid insoluble ash, as well as color and foreign matter. Analysis of essential nutrient retention is also examined for carotenoids and select micro and macro nutrients.

## 2. Materials and methods

### Samples

Spider Plant (Saga) *Gynandropis gynandra* (AIV 12059)  
Black Nightshade (Managu) *Solanum nigrum* (AIV 12060)  
Amaranth (Dodo) *Amaranthus retroflexus* (AIV 12070)  
Cowpea Leaves (Kunde) *Vigna unguiculata* (AIV 12062)

### Total moisture

Samples analyzed in triplicate via standard analysis protocols to assess effectiveness of current post-harvest drying procedure. Having a high outlier, nightshade was run in triplicate twice for validation.

### Ash and acid insoluble ash (AIA).

Ash content analysis is a reflection of total mineral content, AIA indicates contamination with soil or sand. Samples analyzed in triplicate via standard analysis protocols.

### Color & Foreign Matter

Samples surveyed from a range of light green to very dark green with any black or brown material noted.

### Elemental analysis.

Analysis of selected micro and macro nutrients performed by Penn State with triplicate samples prepared by NUANPP laboratory.

### Vitamin A (via B-carotene)

Data reported using spectrophotometric analysis.

## 3. Results & Discussion

### Total moisture

Reported in Table 1, the data indicates spider plant samples are on the high end of acceptable moisture content for international standards (10-12%). Nightshade had a high outlier in both sets of triplicates analyzed. This may indicate that the drying process should be optimized for these two products.

### Color & Foreign Matter

The coloration of samples was quite good with a consistently green appearance. No significant foreign matter was detected (Table 2).

### Total Ash

Reflected in table 1, amaranth was shown to have high ash content. The correlation of ash content with a high mineral content is supported by elemental analysis results in Table 3.

### Acid Insoluble Ash (AIA)

1-1.5% AIA is usually the standard maximum acceptable for cleanliness. Reported by Table 1, the amaranth samples have a high AIA content potentially indicating sand or soil contamination.

### Elemental Analysis

Data reported in Table 3 and Table 4 from all samples indicate a desirable content of essential nutrients: amaranth especially for calcium, spider plant especially for iron.

### Vitamin A (via B-carotene)

Samples analyzed indicate an adequate provision of vitamin A from all three products via  $\beta$ -carotene as analyzed by spectrophotometry. This less common technique is being explored by NUANPP for the development of a low-investment protocol to be shared with developing nations for in-house analysis.

Table 1. Moisture, Total Ash, Acid Insoluble Ash

Species	Moisture (%)	Total Ashes (%)	AIA (%)
Spider Plant (Saga) <i>Gynandropis gynandra</i>	11.8 ± 11%	8.35 ± 3.0%	0.75 SD 7.6%
Black Nightshade (Managu) <i>Solanum nigrum</i>	13.7 ± 68%	7.61 ± 9.3%	0.69 SD 11%
Amaranth (Dodo) <i>Amaranthus retroflexus</i>	9.71 ± 4.2%	14.3 ± 8.8%	1.67 SD 41%

Table 2. Color, Foreign Matter

Species	Color	Foreign Matter
Spider Plant (Saga) <i>Gynandropis gynandra</i>	Dark green with light brown stems	<0.1%
Black Nightshade (Managu) <i>Solanum nigrum</i>	Dark green with light brown stems	<0.1%
Amaranth (Dodo) <i>Amaranthus retroflexus</i>	Dark green with light brown stems	<0.1%
Cowpea Leaves (Kunde) <i>Vigna unguiculata</i> *	Light brown to dark brown & dark green	<0.1%

Table 3. Select macro nutrients

Species	Ca (g/100g)	Mg (g/100g)	K (g/100g)	P (g/100g)
Spider Plant (Saga) <i>Gynandropis gynandra</i>	1.52	0.43	0.94	.94
Black Nightshade (Managu) <i>Solanum nigrum</i>	1.02	0.31	1.86	1.86
Amaranth (Dodo) <i>Amaranthus retroflexus</i>	2.79	1.23	1.99	0.41
Spinach** <i>Spinacia oleracea</i>	0.99	0.79	5.58	0.49

Table 4. Select micronutrients

Species	Zn (mg/100g)	Mn (mg/100g)	Fe (mg/100g)	Vitamin A (IU via $\beta$ -carotene)
Spider Plant (Saga) <i>Gynandropis gynandra</i>	4.6	9.98	58.8	7300 ± 39%
Black Nightshade (Managu) <i>Solanum nigrum</i>	3.7	8.75	35.7	5842 ± 8.9%
Amaranth (Dodo) <i>Amaranthus retroflexus</i>	6.7	15.5	32.3	4855 ± 3.1%
Spinach** <i>Spinacia oleracea</i>	5.3	10.2	27.1	9377

\*Analyzed by NUANPP cowpea leaves included for comparison of less favorable color.  
\*\*Spinach data obtained from USDA Nutrient Database adjusted to 9% moisture

For further information, contact:

Q.L. Wu: qlwu@aesop.rutgers.edu or J.E. Simon: jimsimon@aesop.rutgers.edu