BIOACTIVE COMPONENTS IN INDIGENOUS AFRICAN VEGETABLES

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Introduction

• There are more than 45,000 plant species in Africa and about 1000 are edible as green vegetables (Habwe et al., 2008)

• In Kampala, Uganda, about 38 different types of vegetables are sold in different major markets (Bukenya-Ziraba et al., 1999)

• The most common vegetables were *Amaranthus sp.*, *Solanum sp.*, *Capsicum sp.*; *Cleome gynandra* etc.

• Leafy vegetables are widely consumed with staple starch foods as sauce
Vegetables in Kampala market
Introduction

• Apart from being food, vegetables also offer a number of health benefits and income

• Vegetables are rich in nutrients and bioactive components with medicinal properties that prevent a number of health conditions

• Epidemiological studies indicate a relationship between consumption of vegetables and chronic diseases such as cancer, hypertension and heart diseases

• In Africa, vegetables have strongly been recognized to offer health protecting properties
Green vegetable garden: *Amaranthus hybridus* (Red)

Ethno pharmacological claims: Treating anemia, high blood pressure
Amaranthus cruentus

Ethno pharmacological claims: Treating high blood pressure
Cleome gynandra sp.

Ethno pharmacological claims: High blood pressure, male impotence, induce uterine construction, manage retain placenta, prevent miscarriage, headache and stomach ache, rheumatism and localized pain (Mugisha et al.; Ziraba 1996; Narendhirakannan et al., 2007)
Green vegetable garden: *Solanum aethiopicum*

Ethno pharmacological claims: high blood pressure
Vigna *unguiculata* (cow pea)

Ethno pharmacological claims: management of hypertension
Vegetables for sale @ 0.2USD
Vegetable for livelihood/income

Cost: 1.5-2.0 USD/Tin
Meal of peanut Pasted V. unguiculata

These are biodiverse delicious meals
Cost 1.0 USD
Steamed assorted vegetables

Eaten as side dish with other food or *Nyamachoma* (roasted meat)
Objective of the study

The aim of this study was to evaluate the phytochemical bio-active compounds in selected edible vegetables in Uganda:

- *Amaranthus hybridus*
- *Amaranthus cruentus*
- *Cleome gynandra*
- *Solanum aethiopicum*
- *Vigna unguiculata*
Hypotheses

• Leafy edible vegetables contain bioactive phytochemical compounds with health protecting properties.
Materials and methods

- *Amaranthus cruentus, Amaranthus hybridus, Cleome gynandra, Vigna unguiculata* and *Solanum aethiopicum* vegetables were purchased from a vegetable market trader in Kampala in June 2009.

- The samples were dried in an oven (40-50°C), milled to powder & extracted with diethyl ether, 96% ethanol and distilled water solvents, successively.

- Extracts were analysed for phytochemical compounds (Culei, 1982) and quantitative total flavanoids and total alkaloids (Edeoga et al., 2001).
Results

• These vegetables were found to contain the following phytochemicals:
  • Alkaloids
  • Tannins
  • Flavonoids
  • Saponins
  • Carotenoids
  • Glucides
  • Steroid glycosides
Flavanoids & Alkaloids in Vegetables

- A. hibridus: Total flavanoids 8.7, Total alkaloids 2.7
- A. cruentus: Total flavanoids 12.0, Total alkaloids 3.3
- S. aethiopicum: Total flavanoids 15.2, Total alkaloids 4.0
- C. gymandra: Total flavanoids 26.4, Total alkaloids 3.8
- V. unguiculata: Total flavanoids 10.6, Total alkaloids 1.7
Therapeutic activity: Alkaloid

- Anti microbial (Harbourne, 1991; Okigbo et al., 2009)

- Anti hypertensive (Phillipson, 2000)

- Anti-diabetic (Wei et al., 2003)

- Anti carcinogenic & anti-inflammatory (Iqbal et al., 2006; Okigbo et al., 2009)

- Anti oxidant & Analgesic (Trease and Evan, 2002)
**Therapeutic activity : Flavanoids**

- **Anti-cancer and anti-tumour** (Craig, 1996; Sanchez et al., 2001; Tungjai et al., 2008)

- **Anti oxidant** (Harbourne, 1991; Tungjai et al., 2008)

- **Antimicrobial** - antibacterial & anti viral (Bylka et al., 2004; Igbal et al., 2006)

- **Anti inflammatory** (Weniger et al., 2006)

- **Anti ulcer** (Karimi et al., 2004)
Tannins

– Antimicrobial - antibacterial & anti viral (Trease and Evan, 2002; Harbourne, 1991)

– Anti oxidant & anti-inflammatory (Katiyar et al., 2007)

– Anti ulcer (Karimi et al., 2004; Issa et al., 2005)
Saponins

– Anti microbial (antibacterial & anti viral): Harbourne, 1991; Sparg et al., 2004; SDeniz et al., 2009)

– Diuretic & analgesic- Deniz et al.,2009

– Anti inflammatory-Sparg et al., 2004; Wang et al.,2008
Carotenoids.

- Anticancer & anti aging - Polyakov et al., 2001

- Enhances body immunity - Oslo and Owen, 1998

- Prevention of cardiovascular disease & osteoporosis - Oslo and Owen, 1998; O’cornnell et al., 2006
Coumarins

• Coumarins
  – Anti-cancer and anti-tumour- Kleiner et al., 2008; Prince et al., 2009

  – Anti oxidant, anti inflammatory & cardiovascular disease prevention-Mladenka et al., 2010
Conclusion & recommendation

• A diet rich in these vegetables has a potential to offer better health and prevent a number of health risks

• Food based approach by consumption of vegetables can lead to a lower risk of diseases such as cancer, heart diseases, hypertension and stroke

• There is need to promote the consumption of vegetables to improve human health.
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