Phytochemistry and Free Radical Scavenging Activity of Some Indigenous Vegetables in the Ilocos

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INTRODUCTION

- Various indigenous edible species abound in Ilocos Norte
- 46 indigenous plants were documented (Antonio, et al., 2011)
  - 33 indigenous vegetables (IVs)
  - Wildly grown; some domesticated
Common Indigenous Vegetables (IVs)

- Broussonetia luzonica allukon
- Telosma procumbens kapaskapas
- Schismatoglottis sp. bilagot
- Momordica cochinchinensis sugudsugud
- Mollugo verticillata papait
## Table 1. Traditional use of the five IVs as food and medicine

<table>
<thead>
<tr>
<th>Species/Family</th>
<th>Traditional Use</th>
<th>References</th>
</tr>
</thead>
</table>
| *B. luzonica*       | Male inflorescence and tops are cooked into viand. Female inflorescence are also edible but less preferred. Remedy for skin diseases, open wounds, stomach ache, anthelmintic and colic | Antonio, et al., 2011  
www.erdb.denr.gov.ph                                      |
| *T. procumbens*     | Inflorescence and young fruit for vegetable viand (cooked w/ other vegetables)  
Used for cleansing wounds, scabies, ulcers and headache; as cataplasma, expectorant and antitussive                                                | Antonio, et al., 2011  
www.stuartxchange.com                                     |
| Schismatoglottis sp. | Vegetable dish; leaves arranged and cooked in a pot. Cooked with fish paste, coconut milk, dried fish or dried wild pig meat. Crushed leaves used to revive fainting person | Antonio, et al., 2011                                 |
| *M. cochinchinensis*| Young fruits for vegetable viand, tops for salad and viand  
Treatment for head lice, hemorrhoids, glandular swelling of the neck, mammary abscesses, mesenteric enlargements, bruises, wounds, swellings, pectoral, hepatic and splenic obstructions, unhealthy ulcerations, and lumbago | Antonio, et al., 2011  
www.stuartxchange.com                                     |
| *M. verticillata*   | Tops for salad. Good for anaemic  
Utilized as demulcent and poultice                                                                                                                                                                         | Antonio, et al., 2011  
www.naturalmedicinalherbs.net                              |
• Indigenous vegetables (IVs)
  ◦ good source of vitamins, minerals and phytochemicals
  ◦ medicinal properties: antidiabetic, antimicrobial, antioxidant, and more

• Phytochemicals marked an essential role in disease prevention through their biological activities
OBJECTIVES

- To determine the phytochemical constituents present in the crude extracts derived from the five indigenous vegetables; and
- To evaluate the in vitro antioxidant activity of the indigenous vegetables crude extracts
METHODOLOGY

- Collection Areas: Adams and Batac
- Taxonomic Validation at Phil National Museum (Herbarium voucher specimens deposited)
Preparation of Samples

Collection of samples
- Edible organs: inflorescence, fruit, leaves/leaf tops

Processing of samples
- Samples were weighed, washed, cut/sliced dried, and ground to powder

Preparation of extracts
- Powder samples were macerated and filtered
- Filtrates were concentrated
Phytochemical Screening

- Qualitative phytochemical analysis was done following the standard procedures of Tiwari, et al., 2011 and Himesh, et al., 2011 to determine the following:
  - Alkaloids
  - Flavonoids
  - Tannins
  - Saponins
  - Phenols
  - Coumarins
  - Anthraquinones
  - Cardiac glycosides
  - Steroids
  - Terpenoids
Evaluation of Antioxidant Activity

- DPPH Free Radical Scavenging Assay (Marinova & Batchvarov, 2011 with modifications)
- Extracts: 50-500μg/ml
- Standard/reference: Gallic acid (50-500μg/ml)
- Control: ethanol + DPPH solution (0.06mM)
- Blank: ethanol
- Absorbance were measured using UV-Vis Spectrophotometer at 517nm
- RSA% = ((Abs Cntrl – Abs Sample)/Abs Cntrl)*100
## RESULTS

### Table 2. Phytochemical constituents of the five IVs

<table>
<thead>
<tr>
<th>Plant Species</th>
<th>Alkaloid</th>
<th>Flavonoid</th>
<th>Anthraquinone</th>
<th>Phenol</th>
<th>Steroid</th>
<th>Terpenoid</th>
<th>Saponin</th>
<th>Tannin</th>
<th>Cardiac glycoside</th>
<th>Coumarin</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. luzonica</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>M. verticillata</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
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<tr>
<td>M. cochinchinensis</td>
<td>-</td>
<td>-</td>
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<td>+</td>
<td>-</td>
<td>-</td>
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<td>+</td>
</tr>
<tr>
<td>Schismatoglottis sp.</td>
<td>-</td>
<td>+</td>
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<td>+</td>
<td>-</td>
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<td>+</td>
<td>+</td>
</tr>
<tr>
<td>T. procumbens</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
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<td>+</td>
</tr>
</tbody>
</table>
Table 3. Biological activities of the phytochemicals

<table>
<thead>
<tr>
<th>Phytochemicals</th>
<th>Function</th>
<th>Present In</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phenol</td>
<td>Anti-oxidant, anti-cancer, anti-tumor</td>
<td>All 5 IVs</td>
</tr>
<tr>
<td>Flavonoid</td>
<td>Anti-oxidant, Anti-inflammatory, anti-viral, anti-microbial, anti-cancer, anti-tumor</td>
<td>B. luzonica, M. verticillata, M. cochinchninensis, T. procumbens</td>
</tr>
<tr>
<td>Coumarin</td>
<td>Anti-coagulant, anti-fungi, anti-tumor, anti-cancer, immunostimulant, anti-inflammatory</td>
<td>All 5 IVs</td>
</tr>
<tr>
<td>Tannin</td>
<td>Anti-oxidant, anti-septic, anti-inflammatory, anti-tumor, anti-diarrhoea, haemostatic</td>
<td>B. luzonica, T. Procumbens</td>
</tr>
<tr>
<td>Terpenoid</td>
<td>Anti-oxidant, anti-cancer, anti-malarial, anti-ulcer, hepaticidal, antimicrobial</td>
<td>All 5 IVs</td>
</tr>
<tr>
<td>Steroid</td>
<td>Anti-inflammatory, sedative, insecticidal, cytotoxic</td>
<td>All 5 IVs</td>
</tr>
<tr>
<td>Cardiac glycoside</td>
<td>Cardio-vascular protection, anti-proliferative</td>
<td>All 5 IVs</td>
</tr>
<tr>
<td>Conc. (μg/ml)</td>
<td>Gallic acid</td>
<td>B. luzonica</td>
</tr>
<tr>
<td>--------------</td>
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<td>-------------</td>
</tr>
<tr>
<td>50</td>
<td>94.55±0.07&lt;sup&gt;b&lt;/sup&gt;</td>
<td>28.91±1.74&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
<tr>
<td>100</td>
<td>95.24±0.10&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>67.08±1.89&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>150</td>
<td>95.56±0.07&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>86.90±0.52&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>200</td>
<td>95.73±0.08&lt;sup&gt;a&lt;/sup&gt;</td>
<td>89.00±0.26&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>250</td>
<td>95.83±0.14&lt;sup&gt;a&lt;/sup&gt;</td>
<td>89.35±0.30&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>350</td>
<td>95.98±0.08&lt;sup&gt;a&lt;/sup&gt;</td>
<td>89.78±0.26&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>500</td>
<td>96.26±0.04&lt;sup&gt;a&lt;/sup&gt;</td>
<td>89.95±0.15&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>IC&lt;sub&gt;50&lt;/sub&gt;</td>
<td>15.79</td>
<td>79.34</td>
</tr>
</tbody>
</table>

Values represent mean±SD (n=3)
Figure 1. Antioxidant activity of the five indigenous vegetables
Significance of antioxidants

- Antioxidant activity is much associated with chemo-protective action against oxidative stress causing:
  - Cellular and metabolic injuries
  - Accelerated aging
  - Cancer
  - Cardio-vascular & neurodegenerative diseases
  - Inflammation
- Antioxidants inhibits oxidation by scavenging free radicals
CONCLUSIONS

- Seven phytochemicals present: flavonoids, phenols, steroids, terpenoids, tannins, cardiac glycosides and coumarins
- All five vegetables exhibited antioxidant activity
- These suggest that the five indigenous vegetables are healthy food and could be a possible source of nutraceutical products
RECOMMENDATIONS

- Elucidation of the chemical fingerprint along with the nutritive components of the vegetable species is necessary to:
  - validate the ethnomedicinal uses;
  - determine the antioxidant compounds; and;
  - identify other therapeutic applications.

- Exploratory work on other biological activities is also important to establish the medicinal properties of the five vegetables.
THANK YOU FOR LISTENING!