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)

Brousonetia 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

Species/Family	Traditional Use	References
B. luzonica Moraceae	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 Apocynaceae	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. Araceae	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 Cucurbitaceae	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 Molluginaceae	Tops for salad. Good for anaemic Utilized as demulcent and poultrice	Antonio, et al., 2011 www.naturalmedicinalherbs.net

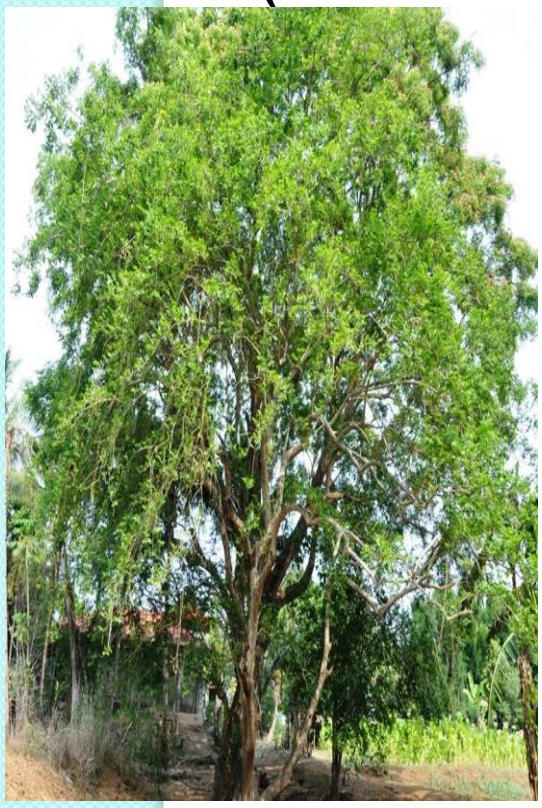
- Indigenous vegetables (IVs)
  - good source of vitamins, minerals and phytochemicals
  - medicinal properties: antidiabetic, antimicrobial, antioxidant, and more
- Phytochemicals marked an essential role in disease prevention through their biological activities

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/leaftops

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

Plant Species	Alkaloid	Flavonoid	Anthraquinone	Phenol	Steroid	Terpenoid	Saponin	Tannin	Cardiac glycoside	Coumarin
B. luzonica	-	+	-	+	+	+	-	+	+	+
M. verticillata	-	+	-	+	+	+	-	-	+	+
M. cochinchinensis	-	-	-	+	+	+	-	-	+	+
Schismatoglottis sp.	-	+	-	+	+	+	-	-	+	+
T. procumbens	-	+	-	+	+	+	-	+	+	+

Table 3. Biological activities of the phytochemicals

Phytochemicals	Function	Present In
Phenol	Anti-oxidant, anti-cancer, anti-tumor	All 5 IVs
Flavonoid	Anti-oxidant, Anti-inflammatory, anti-viral, anti-microbial,, anti-cancer, anti-tumor	*B. luzonica*, *M. verticillata*, *M. cochinchinensis*, *T. procumbens*
Coumarin	Anti-coagulant, anti-fungi, anti-tumor, anti-cancer, immunostimulant, anti-inflammatory	All 5 IVs
Tannin	Anti-oxidant, anti-septic, anti-inflammatory, anti-tumor, anti-diarrhoea, haemostatic	*B. luzonica* *T. Procumbens*
Terpenoid	Anti-oxidant, anti-cancer, anti-malarial, anti-ulcer, hepaticidal, antimicrobial	All 5 IVs
Steroid	Anti-inflammatory, sedative, insecticidal, cytotoxic	All 5 IVs
Cardiac glycoside	Cardio-vascular protection, anti-proliferative	All 5 IVs

Table 4. DPPH radical scavenging activities (%) of the five IVs

Conc. (µg/ml)	Gallic acid	B. luzonica	M. verticillata	M. cochinchinensis	Schismatoglottis sp.	T. procumbens
50	94.55±0.07^{b}	28.91±1.74^{d}	45.11±0.09^{e}	47.28±0.31^{c}	49.14±0.26^{g}	50.10±0.09^{g}
100	95.24±0.10^{ab}	67.08±1.89^{c}	45.71±0.09^{de}	52.17±0.15^{e}	54.59±0.00^{f}	56.56±0.00^{f}
150	95.56±0.07^{ab}	86.90±0.52^{b}	46.52±0.09^{d}	54.69±0.09^{e}	59.28±0.00^{e}	62.36±0.09^{e}
200	95.73±0.08^{a}	89.00±0.26^{a}	46.67±0.09^{d}	58.07±0.15^{e}	63.17±0.35^{d}	68.26±0.09^{d}
250	95.83±0.14^{a}	89.35±0.30^{a}	48.28±0.09^{c}	60.65±0.16^{e}	67.46±0.15^{c}	73.76±0.09^{c}
350	95.98±0.08^{a}	89.78±0.26^{a}	49.39±0.09^{b}	65.79±0.40^{e}	74.27±0.15^{b}	84.56±0.15^{b}
500	96.26±0.04^{a}	89.95±0.15^{a}	51.21±0.09^{a}	73.16±0.09^{e}	81.94±0.09^{a}	93.74±0.09^{a}
IC_{50}	15.79	79.34	405.86	3,062.05	100.76	38.80

Values represent mean±SD (n=3)

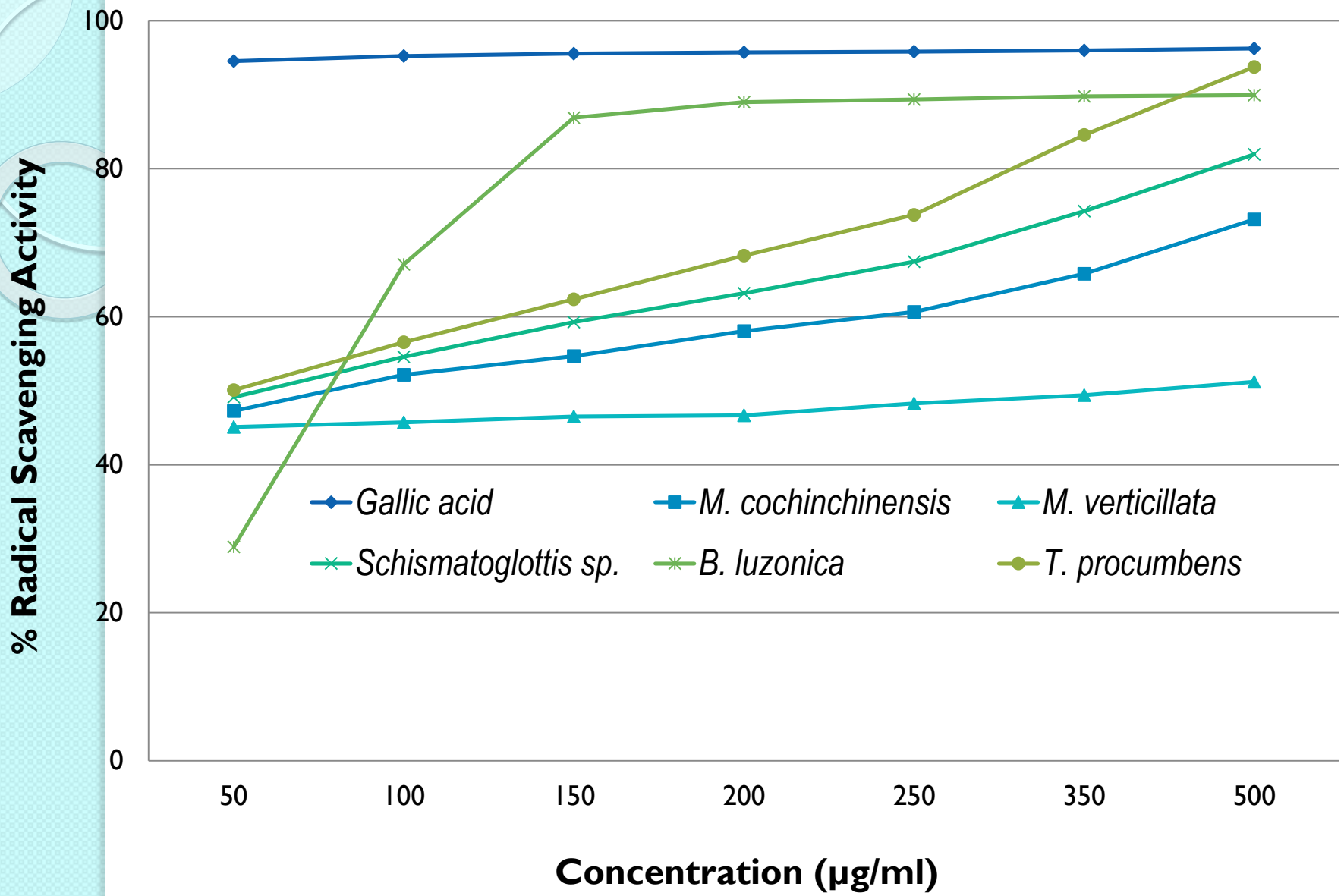


Figure 1. Antioxidant activity of the five indigenous vegetables

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!
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