COUNTRY PROGRESS REPORT ON HERBAL AND MEDICINAL PLANTS: PHILIPPINES

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PRESENTATION OUTLINE

I. Introduction
II. Research and Development Activities on Herbal and Medicinal Plants (HMP)
III. Production and Marketing of HMP Products
IV. Involvement of Private Sectors
V. Conservation Initiatives on HMP
VI. Conclusion

Introduction

Country Progress Report on HMPs: Philippines

INTRODUCTION

- Medicinal plants have been in use since human civilization existed and the first line in sourcing of relief and general healthcare.
- Despite technological advancements, humankind are still going back to the fundamentals when it comes to health and wellness as both developed and developing countries continue to explore the uses of plants in the treatment of illnesses.
- Research undertakings continue to flourish to find out innumerable pharmaceutical purposes of plant parts and their extracts.
- Nonetheless, a lot of these so called “unknown treasures” still lie hidden, and protection and conservation of these herbal and medicinal plants must be part of our primary concern.

Research and Development Activities on Herbal and Medicinal Plants

Country Progress Report on HMPs: Philippines

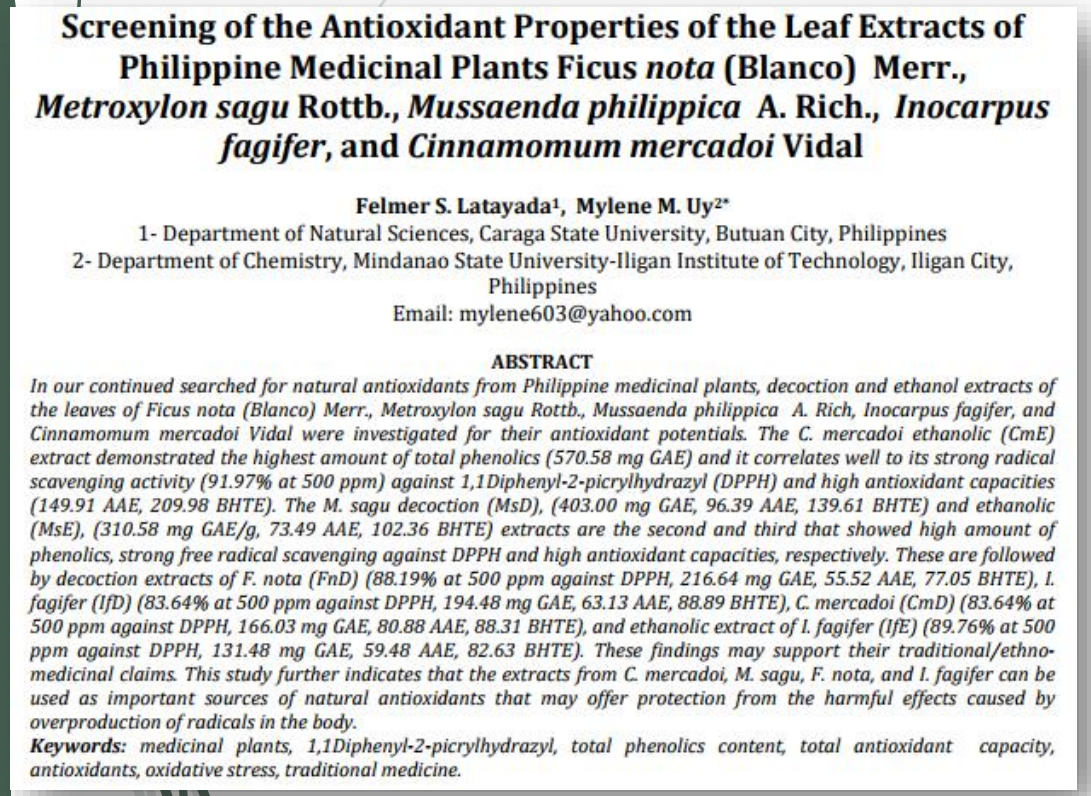
RESEARCH AND DEVELOPMENT ACTIVITIES ON HMP

- Herbal and medicinal plants and the mechanisms of their therapeutic effects have been studied in the Philippines for a long time.

- The following ten (10) research studies have either been published in local or international journals within the past five (5) years and showcases the variety of effects of different HMPs in controlled conditions.

- There is a small scope of researches conducted in the Philippines, however, it provides an insight that the folkloric aspects of these HMPs are slowly transforming and evolving into scientific and medical facts.

RESEARCH AND DEVELOPMENT ACTIVITIES ON HMP



Screening of the Antioxidant Properties of the Leaf Extracts of Philippine Medicinal Plants Ficus *nota* (Blanco) Merr., *Metroxylon sagu* Rottb., *Mussaenda philippica* A. Rich., *Inocarpus fagifer*, and *Cinnamomum mercadoi* Vidal

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ABSTRACT

In our continued searched for natural antioxidants from Philippine medicinal plants, decoction and ethanol extracts of the leaves of Ficus nota (Blanco) Merr., Metroxylon sagu Rottb., Mussaenda philippica A. Rich, Inocarpus fagifer, and Cinnamomum mercadoi Vidal were investigated for their antioxidant potentials. The C. mercadoi ethanolic (CmE) extract demonstrated the highest amount of total phenolics (570.58 mg GAE) and it correlates well to its strong radical scavenging activity (91.97% at 500 ppm) against 1,1Diphenyl-2-picrylhydrazyl (DPPH) and high antioxidant capacities (149.91 AAE, 209.98 BHTE). The M. sagu decoction (MsD), (403.00 mg GAE, 96.39 AAE, 139.61 BHTE) and ethanolic (MsE), (310.58 mg GAE/g, 73.49 AAE, 102.36 BHTE) extracts are the second and third that showed high amount of phenolics, strong free radical scavenging against DPPH and high antioxidant capacities, respectively. These are followed by decoction extracts of F. nota (FnD) (88.19% at 500 ppm against DPPH, 216.64 mg GAE, 55.52 AAE, 77.05 BHTE), I. fagifer (IfD) (83.64% at 500 ppm against DPPH, 194.48 mg GAE, 63.13 AAE, 88.89 BHTE), C. mercadoi (CmD) (83.64% at 500 ppm against DPPH, 166.03 mg GAE, 80.88 AAE, 88.31 BHTE), and ethanolic extract of I. fagifer (IfE) (89.76% at 500 ppm against DPPH, 131.48 mg GAE, 59.48 AAE, 82.63 BHTE). These findings may support their traditional/ethno-medicinal claims. This study further indicates that the extracts from C. mercadoi, M. sagu, F. nota, and I. fagifer can be used as important sources of natural antioxidants that may offer protection from the harmful effects caused by overproduction of radicals in the body.

Keywords: *medicinal plants, 1,1Diphenyl-2-picrylhydrazyl, total phenolics content, total antioxidant capacity, antioxidants, oxidative stress, traditional medicine.*

- "Screening of the Antioxidant Properties of the Leaf Extracts of Philippine Medicinal Plants *Ficus nota* (Blanco) Merr., *Metroxylon sagu* Rottb., *Mussaenda philippica* A. Rich., *Inocarpus fagifer*, and *Cinnamomum mercadoi* Vidal (2016)"
- Study findings indicate that the extracts of said plants can be used as source of natural antioxidants, and as such may support their traditional or ethnomedicinal claims.

*taken from http://bepls.com/FEB_2016/4.pdf

RESEARCH AND DEVELOPMENT ACTIVITIES ON HMP

Antihyperuricemic and Nephroprotective Effects of *Carica papaya* Aqueous Leaf Extract in a Murine Model of Hyperuricemia and Acute Renal Tissue Injury

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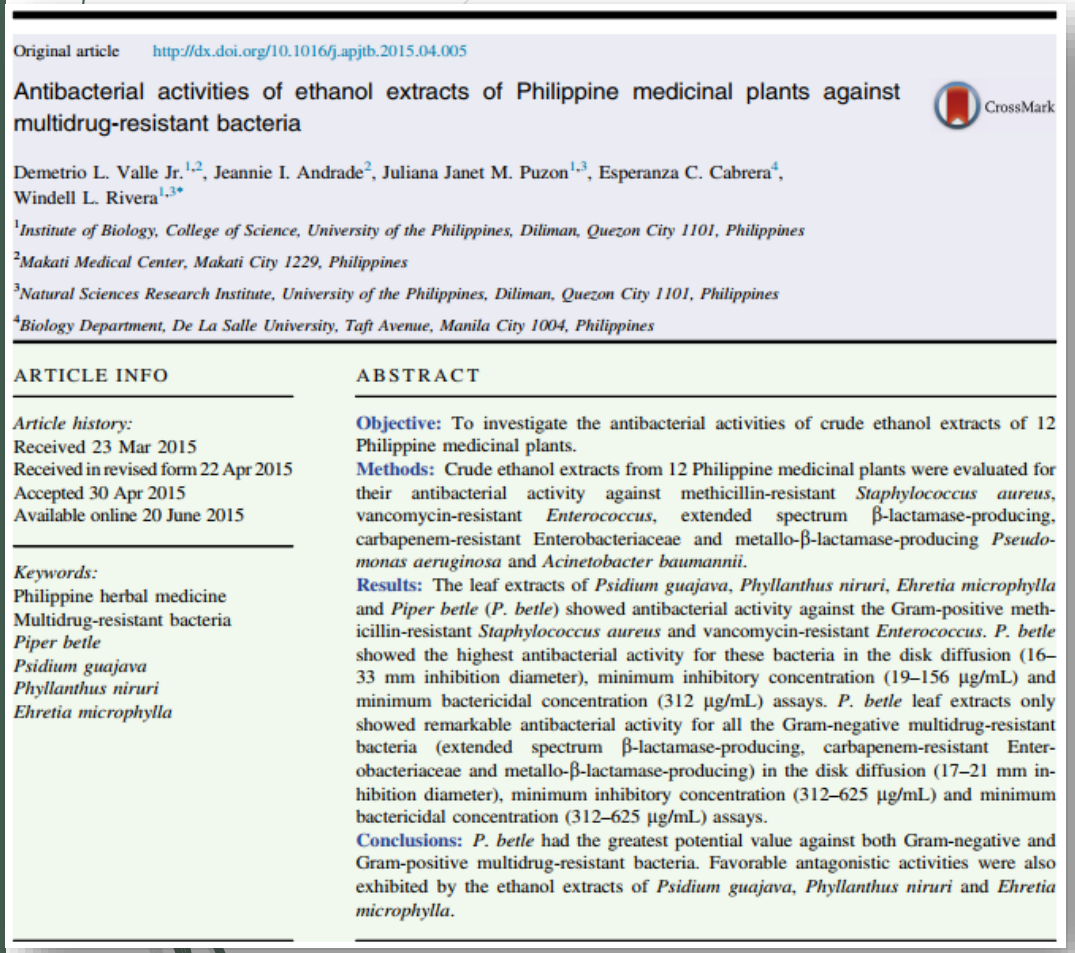
Abstract: This a pilot study on the effects of *Carica papaya* aqueous leaf extract (PLE) on blood uric acid levels (BUA) and kidney histomorphology of potassium bromated ($KBrO_3$)-treated adult male albino mice. PLE was prepared from dried papaya leaves and qualitative phytochemical analysis done showed the presence of alkaloids, flavonoids, 2-deoxysugars, and tannins. Sixty (60) mice were randomized to six groups (n=10): sham and negative controls (sterile water only); positive control (ascorbic acid 200 mg/kg BW); and three experimental groups: PLE1, PLE2 and PLE3 (1, 2, and 3 g/kg body weight [BW]). Baseline fasting BUA at days 0 and 7 were measured. Oral administration of PLE was done for 14 days via gastric gavage. On day 14, the subjects (except sham) were given $KBrO_3$ 200 mg/kg BW via gavage to induce hyperuricemia. BUA was measured pre-$KBrO_3$ (333 h) and post-KBrO3 (336 h). The subjects were then anesthetized and the kidneys were excised for histologic examination. The extent of renal tissue damage was scored using a standard numerical scheme. Results showed a significant rise ($p<0.001$) in the BUA of the negative control from 333 to 336 h, confirming the induction of hyperuricemia. In all PLE-treated groups, BUA levels were not significantly increased ($p>0.05$) from 333 h to 336 h. BUA response to KBrO3, however, was not dose-dependent ($p=0.80$) at PLE 1, 2, and 3 g/kg BW. Histologically, all PLE-treated groups showed significant attenuation of acute renal tissue damage. However, similar to the BUA response, the renal tissue response to injury was not dose-dependent ($p=0.66$) at PLE 1, 2, and 3 g/kg BW. In this study, BUA level was found to be directly correlated with the extent of renal tissue damage. These findings suggest that PLE may have antihyperuricemic and nephroprotective effects in this murine model of hyperuricemia and acute renal tissue injury.

- "Antihyperuricemic and Nephroprotective Effects of *Carica papaya* Aqueous Leaf Extract in a Murine Model of Hyperuricemia and Acute Renal Tissue Injury (2015)"
- A pilot study to determine the effects of the aqueous leaf extract of C. *papaya* on the blood uric acid levels and kidney histomorphology of adult male albino mice.
- Study findings suggests that C. papaya aqueous leaf extract may have antihyperuricemic and nephroprotective effects on mice models with hyperuricemia and acute renal tissue injury.

*taken from http://www.dlsu.edu.ph/conferences/dlsu_research_congress/2015/proceedings/FNH/002FNH_Calderon_PE.pdf

RESEARCH AND DEVELOPMENT ACTIVITIES ON HMP



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Antibacterial activities of ethanol extracts of Philippine medicinal plants against multidrug-resistant bacteria

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Phyllanthus niruri
Ehretia microphylla

ABSTRACT

Objective: To investigate the antibacterial activities of crude ethanol extracts of 12 Philippine medicinal plants.

Methods: Crude ethanol extracts from 12 Philippine medicinal plants were evaluated for their antibacterial activity against methicillin-resistant *Staphylococcus aureus*, vancomycin-resistant *Enterococcus*, extended spectrum β-lactamase-producing, carbapenem-resistant Enterobacteriaceae and metallo-β-lactamase-producing *Pseudomonas aeruginosa* and *Acinetobacter baumannii*.

Results: The leaf extracts of *Psidium guajava*, *Phyllanthus niruri*, *Ehretia microphylla* and *Piper betle* (*P. betle*) showed antibacterial activity against the Gram-positive methicillin-resistant *Staphylococcus aureus* and vancomycin-resistant *Enterococcus*. *P. betle* showed the highest antibacterial activity for these bacteria in the disk diffusion (16–33 mm inhibition diameter), minimum inhibitory concentration (19–156 μg/mL) and minimum bactericidal concentration (312 μg/mL) assays. *P. betle* leaf extracts only showed remarkable antibacterial activity for all the Gram-negative multidrug-resistant bacteria (extended spectrum β-lactamase-producing, carbapenem-resistant Enterobacteriaceae and metallo-β-lactamase-producing) in the disk diffusion (17–21 mm inhibition diameter), minimum inhibitory concentration (312–625 μg/mL) and minimum bactericidal concentration (312–625 μg/mL) assays.

Conclusions: *P. betle* had the greatest potential value against both Gram-negative and Gram-positive multidrug-resistant bacteria. Favorable antagonistic activities were also exhibited by the ethanol extracts of *Psidium guajava*, *Phyllanthus niruri* and *Ehretia microphylla*.

- "Antibacterial Activities of Ethanol Extracts of Philippine Medicinal Plants Against Multidrug-Resistant Bacteria (2015)"
- The study made use of *Psidium guajava*, *Phyllanthus niruri*, *Ehretia macrophylla*, and *Piper betle*.
- *P. betle* has the highest potential value against Gram-negative and Gram-positive multidrug-resistant bacteria. Favorable antagonistic activities were also exhibited by ethanol extracts of other plants.

*taken from http://www.sciencedirect.com/science/article/pii/S2221169115000854?via%3Dihub

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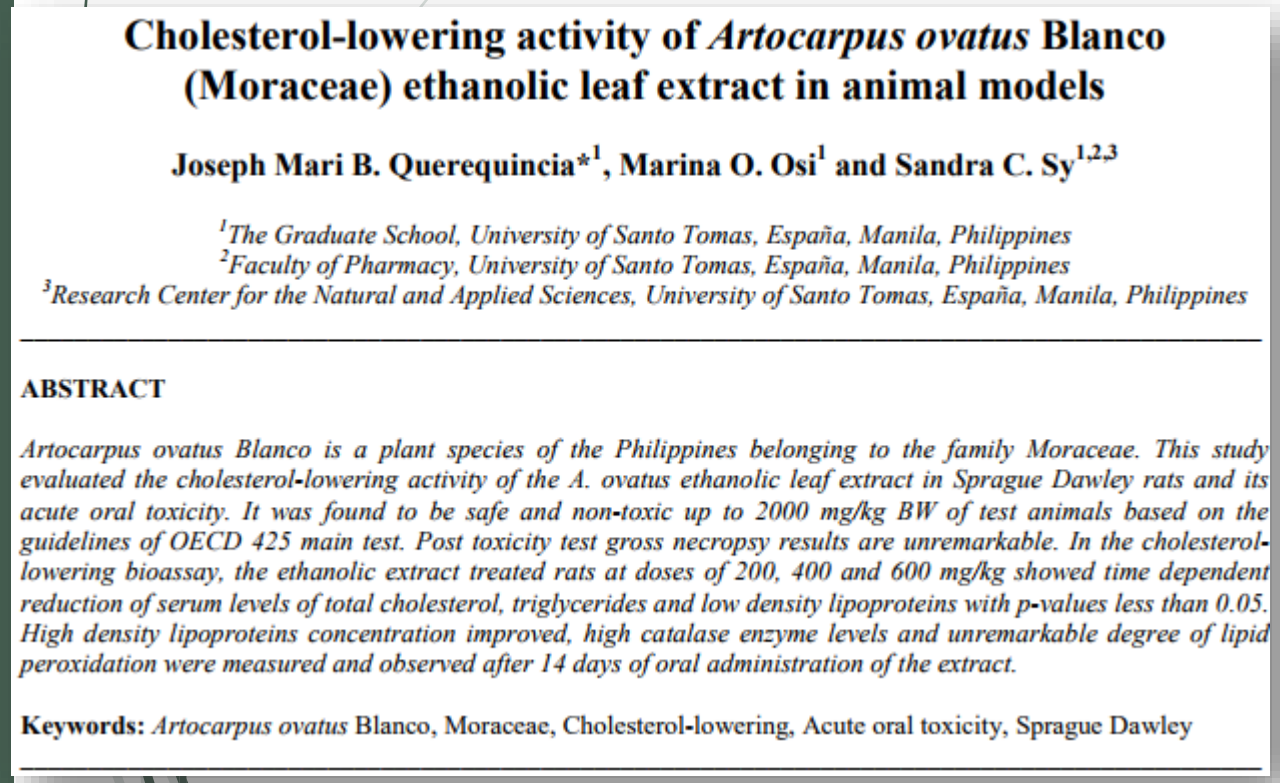

Cholesterol-lowering activity of *Artocarpus ovatus* Blanco (Moraceae) ethanolic leaf extract in animal models

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ABSTRACT

Artocarpus ovatus Blanco is a plant species of the Philippines belonging to the family Moraceae. This study evaluated the cholesterol-lowering activity of the A. ovatus ethanolic leaf extract in Sprague Dawley rats and its acute oral toxicity. It was found to be safe and non-toxic up to 2000 mg/kg BW of test animals based on the guidelines of OECD 425 main test. Post toxicity test gross necropsy results are unremarkable. In the cholesterol-lowering bioassay, the ethanolic extract treated rats at doses of 200, 400 and 600 mg/kg showed time dependent reduction of serum levels of total cholesterol, triglycerides and low density lipoproteins with p-values less than 0.05. High density lipoproteins concentration improved, high catalase enzyme levels and unremarkable degree of lipid peroxidation were measured and observed after 14 days of oral administration of the extract.

Keywords: *Artocarpus ovatus* Blanco, Moraceae, Cholesterol-lowering, Acute oral toxicity, Sprague Dawley

- "Cholesterol-lowering Activity of *Artocarpus ovatus* Blanco (Moraceae) Ethanolic Leaf Extract in Animal Models (2015)"
- Study revealed that *A. ovatus* leaf extract showed time dependent reduction of serum levels of total cholesterol, triglycerides, and low density lipoproteins in Sprague Dewly rats.

*taken from http://www.jocpr.com/articles/cholesterollowering-activity-of-artocarpus-ovatus-blanco-moraceae-ethanolic-leaf-extract-in-animal-models.pdf

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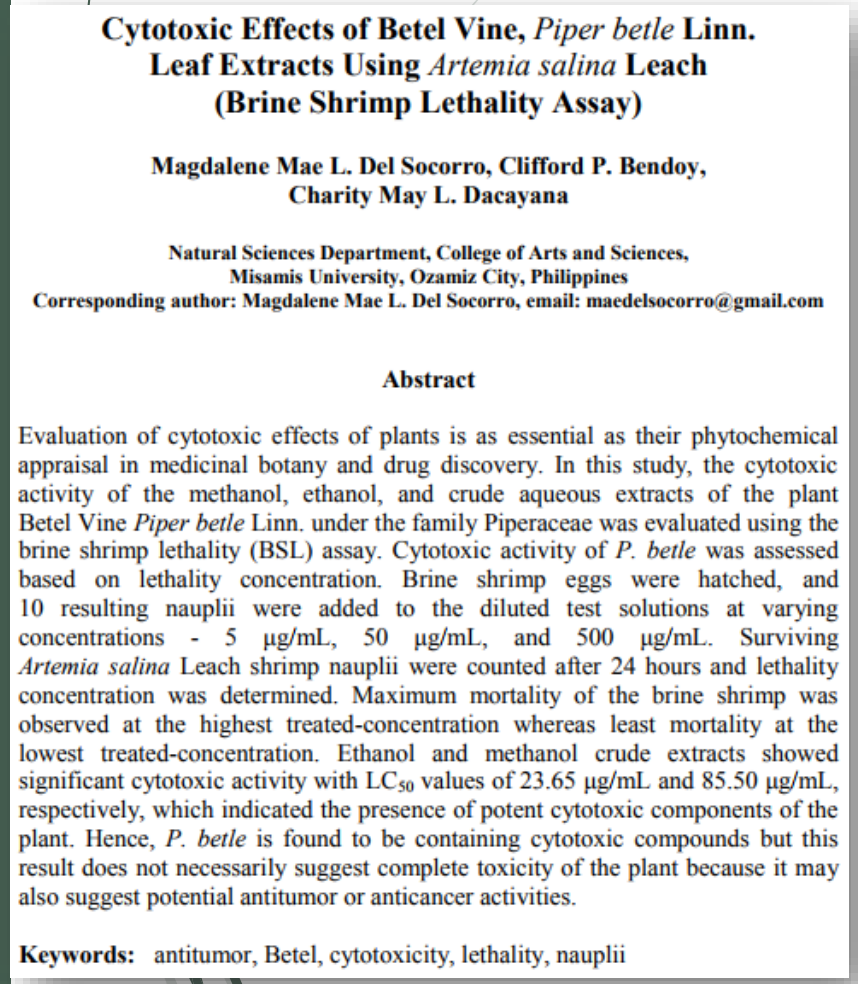

Cytotoxic Effects of Betel Vine, *Piper betle* Linn. Leaf Extracts Using *Artemia salina* Leach (Brine Shrimp Lethality Assay)

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Abstract

Evaluation of cytotoxic effects of plants is as essential as their phytochemical appraisal in medicinal botany and drug discovery. In this study, the cytotoxic activity of the methanol, ethanol, and crude aqueous extracts of the plant Betel Vine *Piper betle* Linn. under the family Piperaceae was evaluated using the brine shrimp lethality (BSL) assay. Cytotoxic activity of *P. betle* was assessed based on lethality concentration. Brine shrimp eggs were hatched, and 10 resulting nauplii were added to the diluted test solutions at varying concentrations - 5 µg/mL, 50 µg/mL, and 500 µg/mL. Surviving *Artemia salina* Leach shrimp nauplii were counted after 24 hours and lethality concentration was determined. Maximum mortality of the brine shrimp was observed at the highest treated-concentration whereas least mortality at the lowest treated-concentration. Ethanol and methanol crude extracts showed significant cytotoxic activity with LC_{50} values of 23.65 µg/mL and 85.50 µg/mL, respectively, which indicated the presence of potent cytotoxic components of the plant. Hence, *P. betle* is found to be containing cytotoxic compounds but this result does not necessarily suggest complete toxicity of the plant because it may also suggest potential antitumor or anticancer activities.

Keywords: antitumor, Betel, cytotoxicity, lethality, nauplii

- "Cytotoxic Effects of Betel Vine *Piper betle* Linn. Leaf Extracts Using *Artemia salina* Leach (Brine Shrimp Lethality Assay) [2014]"
- *P. betle* leaf extract is found to be containing cytotoxic compounds and may also suggest potential anti-tumor or anti-cancer activities.

*taken from http://multidisciplinaryjournal.com/pdf/Cytotoxic.pdf

RESEARCH AND DEVELOPMENT ACTIVITIES ON HMP

THE EFFECTS OF *MOMORDICA CHARANTIA* CRUDE LEAF EXTRACT ON THE ENZYME KINETICS OF PORCINE ALPHA AMYLASE

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Abstract: Diabetes Mellitus, is classed as a carbohydrate disorder marked by high levels of blood sugar in the body caused by insufficient insulin production (Type 1 diabetes) or insulin resistanance (Type 2 diabetes). It is considered as one of the most widespread diseases and numerous researches have been conducted to provide efficient and cost-effective therapeutic remedies and medications for diabetic patients. Treatments by the use of crude leaf extracts of *Momordicacharantia* is by far the most broadly investigated and the most commonly acclaimed remedy in Asia. *M.charantia*, also referred to as bitter gourd or ampalaya have been found to exhibit hypoglycemic actions. A previous study conducted by DLSU students showed that the crude extracts of *M.charantia* affected the kinetics of the enzyme alpha amylase. Amylases are enzymes responsible for the breakdown of starch to glucose. Alpha-amylase or 1,4-D-glucan glucanohydrolase hydrolyses linear polymers at internal bonds. To further measure its efficiency, the effects of various concentration of crude leaf extract of *Momordicacharantia*on the enzyme kinetics of porcine alpha-amylase were determined using the Bernfeld Assay. The MichaelisMenten constant (K_m) and the maximum velocity (V_{max}) of alpha amylase with starch as a substrate and porcine pancreatin as the source of alpha amylase, with and without the leaf extracts were established using the Michaelis-Menten and Lineweaver-Burk plots. Results illustrated uncompetitive inhibition due to the decrease in the values of K_m and V_{max}. Another proposed model is the possibility of several allosteric effectors. The effects of the crude leaf extract of *Momordicacharantia*on the activity of alpha amylase may be valuable in the search for new therapeutic remedies for diabetes

- "The Effects of *Momordica charantia* Crude Leaf Extract on the Enzyme Kinetics of Porcine Alpha Amylase (2013)"
- The study concludes that the effects of *M. charantia* crude leaf extract on the activity of alpha amylase may be valuable in the search for new remedies for diabetes.

*taken from http://www.dlsu.edu.ph/conferences/dlsu_research_congress/2013/_pdf/FNH/FNH-I-006.pdf

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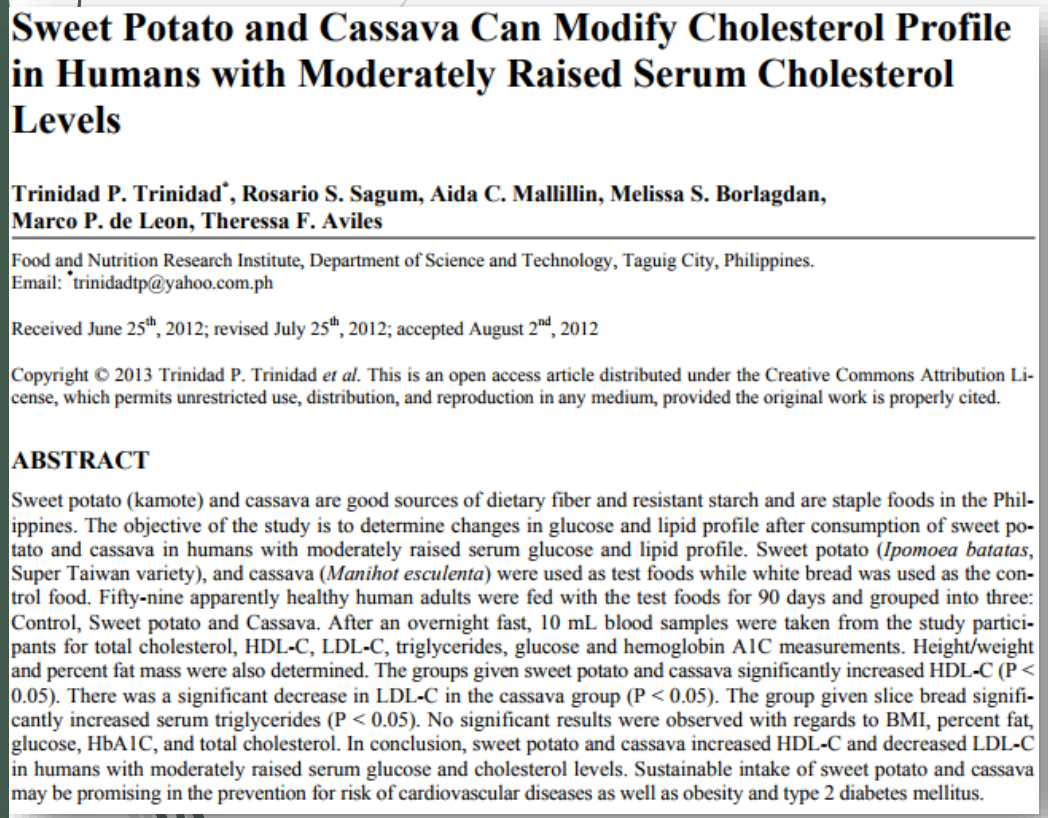

Sweet Potato and Cassava Can Modify Cholesterol Profile in Humans with Moderately Raised Serum Cholesterol Levels

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ABSTRACT

Sweet potato (kamote) and cassava are good sources of dietary fiber and resistant starch and are staple foods in the Philippines. The objective of the study is to determine changes in glucose and lipid profile after consumption of sweet potato and cassava in humans with moderately raised serum glucose and lipid profile. Sweet potato (*Ipomoea batatas*, Super Taiwan variety), and cassava (*Manihot esculenta*) were used as test foods while white bread was used as the control food. Fifty-nine apparently healthy human adults were fed with the test foods for 90 days and grouped into three: Control, Sweet potato and Cassava. After an overnight fast, 10 mL blood samples were taken from the study participants for total cholesterol, HDL-C, LDL-C, triglycerides, glucose and hemoglobin A1C measurements. Height/weight and percent fat mass were also determined. The groups given sweet potato and cassava significantly increased HDL-C ($P < 0.05$). There was a significant decrease in LDL-C in the cassava group ($P < 0.05$). The group given slice bread significantly increased serum triglycerides ($P < 0.05$). No significant results were observed with regards to BMI, percent fat, glucose, HbA1C, and total cholesterol. In conclusion, sweet potato and cassava increased HDL-C and decreased LDL-C in humans with moderately raised serum glucose and cholesterol levels. Sustainable intake of sweet potato and cassava may be promising in the prevention for risk of cardiovascular diseases as well as obesity and type 2 diabetes mellitus.

- "Sweet Potato and Cassava can Modify Cholesterol Profile in Humans with Moderately Raised Serum Cholesterol Levels (2013)"
- Sweet potato and cassava consumption increased HDL-C and decreased LDL-C in humans with moderately raised serum glucose and cholesterol levels.

*taken from https://file.scirp.org/pdf/FNS_2013050813543653.pdf

RESEARCH AND DEVELOPMENT ACTIVITIES ON HMP

Supression of Growth of Some Medically Important Bacterial Pathogens (*Escherichia coli, Staphylococcus aureus, Pseudomonas aeruginosa, and Salmonella typhimurium)* with Plant Extracts of Selected Indigenous Semi-Temperature Medicinal Plants in the Philippines

(This research was a collaboration among different universities in the Cordillera Administrative Region under the Commission on Higher Education Zonal Research Grant. It was also presented orally during the Ratchaphruek 2011 International Symposium on Medicinal and Aromatic Plants on December 15-18, 2011 at Chiang Mai, Thailand)

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Abstract

The suppression of growth of bacterial pathogens (*Escherichia coli, Staphylococcus aureus, Pseudomonas aeruginosa,* and *Salmonella typhimurium*) employing the standard Modified Kirby-Bauer Disc Diffusion Assay was evaluated. In addition, the different plant extracts were also subjected to phytochemical screening to determine the presence of natural products (secondary metabolites), i.e., alkaloids, steroids, anthraquinones, flavonoids, saponins, tannins and polyphenols, and cyanogenic glycosides which may be responsible for the antibacterial property of the plants. Extracts from the following plants were utilized: *Persea americana* (avocado), *Chrysophyllum cainito* (caimito), *Anona muricata* (guyabano), *Artocarpus heterophyllus* (langka), *Carica papaya* (papaya), and *Sandoricum koetjape* (santol). For the phytochemical screening, the presence of alkaloids, steroids, anthraquinones, flavonoids, saponins, tannins, and polyphenols in the leaf extracts were proven. In the test for antimicrobial activity, bacterial species treated with the plants extracts and the different antibacterial agents showed significant differences in terms of the zones of inhibition, while no change in the zones of inhibition of the microorganisms treated with methanol. The highest antimicrobial potential was observed in *P. americana* extract with the highest activity against *S. aureus*. However, *C. cainito* and *A. teterophyllus* extracts did not present any antimicrobial activity against *S. typhimurium*. The results of the present study suggest synergistic antibacterial activity between the antibiotics and plant extracts against the pathogenic bacteria. The results obtained with *E. coli*, *P. aeruginosa*, and *S. typhimurium* were particularly interesting since they were inhibited by most of the plant extracts.

- "Suppression of Growth of Some Medically Important Bacterial Pathogens (*Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and *Salmonella typhimurium*) with Plant Extracts of Selected Indigenous Semi-Temperature Medicinal Plants in the Philippines (2012)"
- Plant extracts of *Persea americana* (avocado), *Chrysophyllum cainito* (caimito), *Anona muricata* (guyabano), *Artocarpus heterophyllus* (langka), *Carica papaya* (papaya), and *Sandoricum koetjape* (santol) were used.
- *E. coli*, *P. aeruginosa*, and *S. typhimurium* were inhibited by most of the plant extracts. *P. americana* plant extract has highest activity against *S. aureaus, while C. cainito* and *A. heterophyllus* plant extracts have no effect on *S. typhimurium*.

*taken from http://www.uc-bcf.edu.ph/Images/Research%20Journals/2012.10.19TANGKOYOB.pdf

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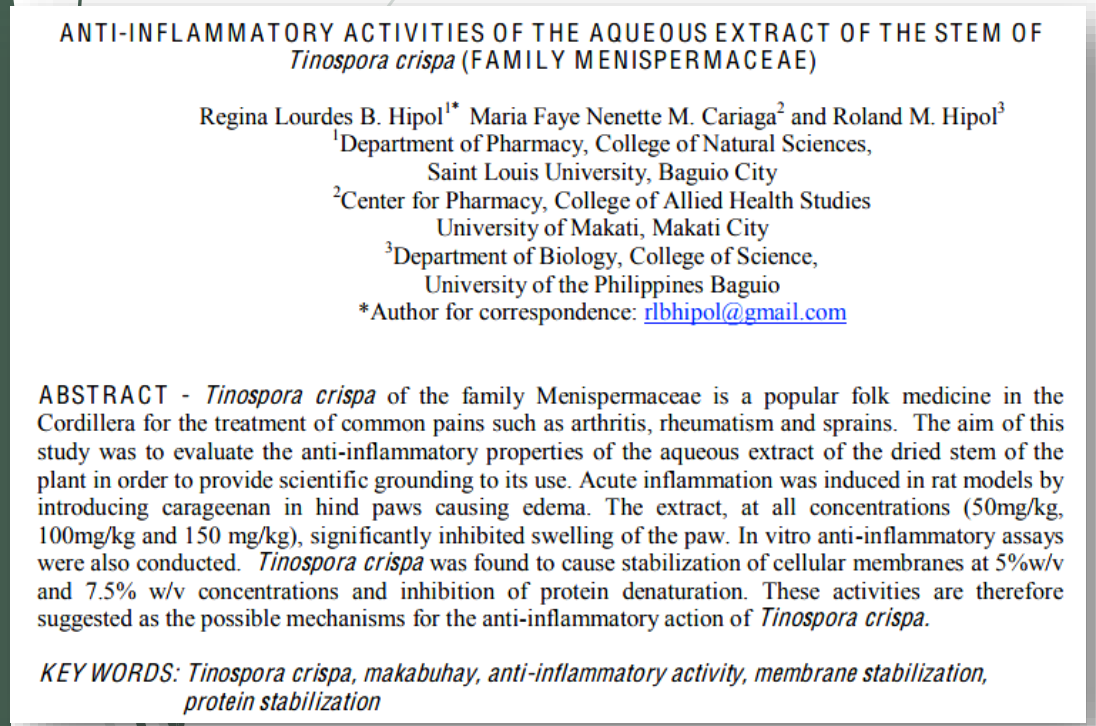

ANTI-INFLAMMATORY ACTIVITIES OF THE AQUEOUS EXTRACT OF THE STEM OF *Tinospora crispa* (FAMILY MENISPERMACEAE)

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ABSTRACT - *Tinospora crispa* of the family Menispermaceae is a popular folk medicine in the Cordillera for the treatment of common pains such as arthritis, rheumatism and sprains. The aim of this study was to evaluate the anti-inflammatory properties of the aqueous extract of the dried stem of the plant in order to provide scientific grounding to its use. Acute inflammation was induced in rat models by introducing carageenan in hind paws causing edema. The extract, at all concentrations (50mg/kg, 100mg/kg and 150 mg/kg), significantly inhibited swelling of the paw. In vitro anti-inflammatory assays were also conducted. *Tinospora crispa* was found to cause stabilization of cellular membranes at 5%w/v and 7.5% w/v concentrations and inhibition of protein denaturation. These activities are therefore suggested as the possible mechanisms for the anti-inflammatory action of *Tinospora crispa.*

KEY WORDS: Tinospora crispa, makabuhay, anti-inflammatory activity, membrane stabilization, protein stabilization

- "Anti-Inflammatory Activities of the Aqueous Extract of the Stem of *Tinospora crispa* (2012)"
- Acute inflammations were applied to the hind paws of rat models prior to application *T. crispa* aqueous extract on inflamed area.
- Results showed that the extract *T. crispa* significantly inhibited the swelling of the paw, *T. crispa* was found to cause stabilization of cellular membranes and inhibition of protein denaturation.

*taken from http://www.journalofnaturestudies.org/files/88-95-Tinospora-full.pdf

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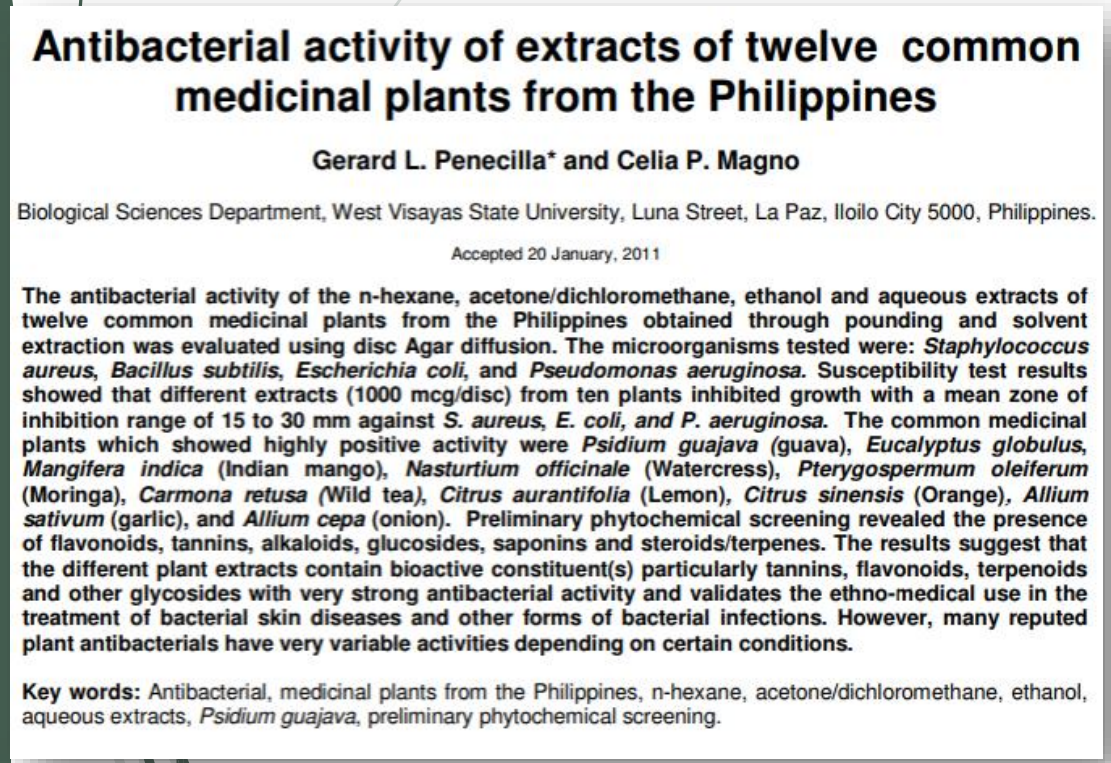

Antibacterial activity of extracts of twelve common medicinal plants from the Philippines

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The antibacterial activity of the n-hexane, acetone/dichloromethane, ethanol and aqueous extracts of twelve common medicinal plants from the Philippines obtained through pounding and solvent extraction was evaluated using disc Agar diffusion. The microorganisms tested were: *Staphylococcus aureus*, *Bacillus subtilis*, *Escherichia coli*, and *Pseudomonas aeruginosa*. Susceptibility test results showed that different extracts (1000 mcg/disc) from ten plants inhibited growth with a mean zone of inhibition range of 15 to 30 mm against *S. aureus*, *E. coli*, and *P. aeruginosa*. The common medicinal plants which showed highly positive activity were *Psidium guajava* (guava), *Eucalyptus globulus*, *Mangifera indica* (Indian mango), *Nasturtium officinale* (Watercress), *Pterygospermum oleiferum* (Moringa), *Carmona retusa* (Wild tea), *Citrus aurantifolia* (Lemon), *Citrus sinensis* (Orange), *Allium sativum* (garlic), and *Allium cepa* (onion). Preliminary phytochemical screening revealed the presence of flavonoids, tannins, alkaloids, glucosides, saponins and steroids/terpenes. The results suggest that the different plant extracts contain bioactive constituent(s) particularly tannins, flavonoids, terpenoids and other glycosides with very strong antibacterial activity and validates the ethno-medical use in the treatment of bacterial skin diseases and other forms of bacterial infections. However, many reputed plant antibacterials have very variable activities depending on certain conditions.

Key words: Antibacterial, medicinal plants from the Philippines, n-hexane, acetone/dichloromethane, ethanol, aqueous extracts, *Psidium guajava*, preliminary phytochemical screening.

- "Antibacterial Activity of Extracts of Twelve Common Medicinal Plants from the Philippines (2011)"
- Plant extracts of guava, blue gum, mango, watercress, malunggay, wild tea, lemon, orange, garlic, and onion were found to be effective in the study.
- Effects of said plant extracts on *Staphylococcus aureaus*, *Baccilus subtilis*, *Escherchia coli*, and *Pseudomonas aeruginosa* were observed.
- Results showed that extracts have bioactive constituents with very strong antibacterial properties which validates its medical use.

*taken from http://www.academicjournals.org/article/article1380713010_Penecilla%20and%20Magno.pdf

Production and Marketing of Herbal and Medicinal Plants

Country Progress Report on HMPs: Philippines

PRODUCTION AND MARKETING OF HMP PRODUCTS

- Cough medicine from lagundi (*Vitex negundo*) was first introduced in the Philippine market on 1994.
- It faced extreme consumer skepticism and didn't sell much.
- Concerted efforts to improve the image of herbal medicine and lagundi-derived products has been conducted, this includes licensing agreements as support to this endeavor.
- The drug eventually became successful.

*taken from http://www.wipo.int/ipadvantage/en/details.jsp?id=3661

*all photos are properties of their respective owners

PRODUCTION AND MARKETING OF HMP PRODUCTS

- Lagundi (*Vitex negundo*) farmers in Roxas, Palawan sell dried leaves to pharmaceutical companies who then convert these into capsules and tablets.
  (http://business.inquirer.net/198171/unleashing-the-full-potential-of-social-enterprises-in-ph)
- Pascual Laboratories, Inc. is one company that sources its dried lagundi leaves from the said farmers.
  (http://www.wipo.int/ipadvantage/en/details.jsp?id=3661)

Pascual Laboratories, Inc.

*all photos are properties of their respective owners

Involvement of Private Sectors

Country Progress Report on HMPs: Philippines

INVOLVEMENT OF PRIVATE SECTORS

Trusted Quality Healthcare

- In 2017 of May, a research and development center for local medicinal plants was inaugurated.
- The facility is known as Sentrong Katutubong Yaman (SeKaYa) Research and Development Plant.
- SeKaYa is an affiliate of United Laboratories, Inc. (UniLab), a pharmaceutical and healthcare company in the Philippines.

*taken from http://www.pchrd.dost.gov.ph/index.php/news/library-health-news/6275-r-d-center-for-local-medicinal-plants-inaugurated

INVOLVEMENT OF PRIVATE SECTORS

- The Remnant Institute of Alternative Medicine (RIAM) and the Agricultural Training Institute (ATI) launched the First Philippine Farm and Herbal Tourism in the Philippines in 2015.
- With the project, ATI and RIAM play a vital role in educating and providing the necessary health information as well as the skills on production, utilization, harvesting, processing, and marketing.

*taken from http://ati.da.gov.ph/director/2015/first-philippine-farm-herbal-tourism-launched

INVOLVEMENT OF PRIVATE SECTORS

- Implemented a four-year project entitled "DNA Barcoding for Authentication of Philippine Medicinal Plants" on 2015.
- Aims to create an online database and a medicinal guidebook for flora found in the Philippines with the help of DNA barcoding.
- Project is funded by the Department of Science and Technology.

*taken from http://varsitarian.net/news/20150307/ust_leads_way_in_barcoding_of_ph_medicinal_plants

Conservation Initiatives on Herbal and Medicinal Plants

Country Progress Report on HMPs: Philippines

CONSERVATION INITIATIVES ON HMP

Quezon province plants seeds of medicinal agro-industries

'We are now shifting to a healthier lifestyle. We are more conscious of what we eat and drink'

By: Delfin T. Mallari Jr. - @inquirerdotnet Inquirer Southern Luzon / 12:22 AM April 27, 2016

- Farmer cooperators were enjoined through the local government's Quezon Herbal Industry Program.
- The program provides cooperators with trainings, seminars, and technical support from the provincial government.
- Interested parties may join as long as they are willing to learn and have an accessible farmland with an adequate water source.

*taken from http://business.inquirer.net/209814/quezon-province-plants-seeds-of-medicinal-agro-industries

CONSERVATION INITIATIVES ON HMP

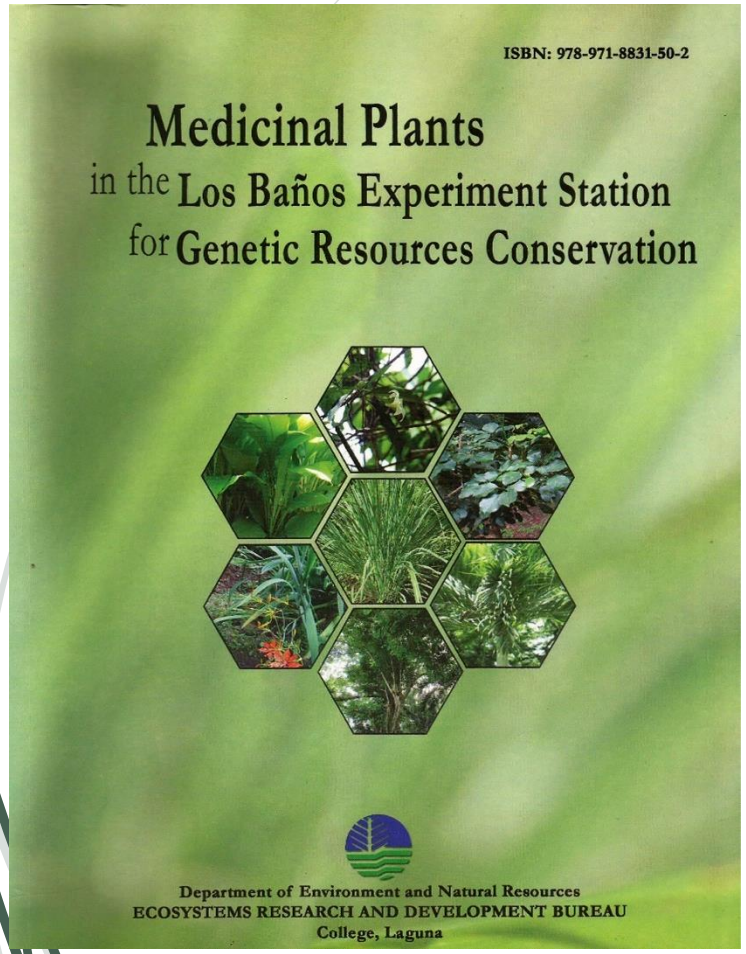
- Quezon Protected Landscape Herbal Pavilion
- established on 2015
- a joint activity of the Provincial Government of Quezon, LGU of Atimonan, and DENR R4-A
- serves as a source of various herbal plants

*photo taken from https://chitsblog.wordpress.com/tag/quezon-protected-landscape-herbal-pavilion/

CONSERVATION INITIATIVES ON HMP

- The Ecosystems Research and Development Bureau (ERDB) has been maintaining a medicinal plant genebank since January 1989 in an effort to conserve plant species that may have medicinal properties.
- Plants in this genebank include 40 trees, 31 shrubs, 37 herbs, 5 grasses, 3 ferns, and 2 palms.

CONSERVATION INITIATIVES ON HMP



- A book entitled, "Medicinal Plants in the Los Baños Experiment Station for Genetic Resources Conservation" was published this year.

- The book details the many plants in ERDB's Medicinal Plant Genebank and serves as a tool in increasing people's awareness on said plants.

CONCLUSIONS

- Continuous relevant research on HMPs are abundant in the Philippines and greatly aid in transforming the face of HMPs from folklore to fact.
- In terms of production and marketing, HMP products are also abundant in the Philippine market, with lagundi-based (*Vitex negundo*) products being the most common.
- Pharmaceutical companies and other private institutions are quite active in the research and development and promotion of HMPs.
- In the Philippines, local government units, and government agencies are most relevant in the conservation of HMPs.

MARAMING SALAMAT PO.

Thank you very much.