JAASP

RESEARCH PAPER



# Qualitative Phytochemical Screening of Selected Medicinal Plant Species of the Philippines

Maribeth R. Laurente*, John A. Adegoke, Eunice Adeola Ademakinwa, James Carlo C. Afable, Deemah H. Aguam, Christalyn Joy A. Bagsarsa, Sheen Dazel D. Balidang, Emily C. Cajandab, Bianca M. Cammayo, Maria Hannah R. Carido, Jasmine D. Cornelio[a], Yvonne Xena G. Estorque[a], Cyrus Jefferson A. Faa[a], Mansur Fashola, Karina Arianna Nicolen S. Garcia, Baraka Olabisi Hamzah, Nova Gracia P. Lucenio, Ara Mae M. Molino, Ellen Shannen Mae P. Monares, Joshua Clarence R. Pamaran, Chaia Alyssa M. Reyes, Sherilyn Lovely A. Reyes, Justline Ghin I. Rosal, Joann Kaye T. Sasis

[a]Faculty of Pharmacy, University of Perpetual Help System-Dalta, Las Piñas Metro Manila, Philippines.

**Keywords**
Medicinal plants,
Phytochemistry,
Alkaloid,
Saponin,
Tannin

**Correspondence**
Maribeth R. Laurente
Postal Address: Blk 3, Lt10, Daimar Homes, Pamplona Tres, Las Piñas City, Metro Manila, Philippines.

**E-mail**
maribethrlaurente@gmail.com

## Abstract

The use of plants as source of herbal therapeutic agents have been established long before modernization have completely conquered earth. The Philippines is known for its rich biodiversity, specially in its flora. The study focused on the investigation of the phytochemistry of fourteen commonly encountered medicinal plants in the Philippines. The presence of alkaloids, cardenolides, anthraquinones, flavonoids, saponins, tannins, and cyanogenic glycosides were tested in the hydroalcoholic leaf extract of *Lagerstroemia speciosa* (Lythraceae), *Syzygium cumini* (Myrtaceae), *Plectranthus amboinicus (*Fam. Lamiaceae*), Jasminum sambac*(Fam. Oleaceae*), Punica granatum* (Punicaceae), *Apium graveolens* Linn. (Apiaceae), *Carmona retusa* (Boraginaceae), *Plectranthus scutellarioides* (Lamiaceae), *Senna alata* (Fabaceae)*, Orthosiphone aristatus*(Lamiaceae)*, Leucaena leucocephala* (Fabaceae), *Morinda citrifolia* (Rubiaceae), *Andrographis paniculata* (Acanthaceae), and *Peperomia pellucida* (Piperaceae). The results have shown that majority of the selected plant species contain alkaloid, saponins and tannins. The antimicrobial, antioxidant, and anti-inflammatory activity of the selected plant materials can be correlated on their phytochemistry.

## Introduction

The Philippines has been known for its rich tropical biodiversity. As of 2006, there are 16, 223 known and described plant species found in the Philippines, and approximately 6,286 of that are said to be endemic (Catibog-Sinha CS& Heaney LR, 2006). In the Philippines, plants serve as the major source of household remedy for almost every ailment. According to WC Evans (2009), plants have been utilised in all major system of medicine which makes their employment, whether as a treatment or a supplemental therapy, certainly universal. The selected fourteen species are listed as part of the most common medicinal plants utilized in the Philippines based on the national formulary. This study includes the comprehensive phytochemical analysis of the following plant species: *Lagerstroemia speciosa* (Lythraceae),*Syzygium cumini* (Myrtaceae), *Plectranthus amboinicus (*Fam. Lamiaceae*), Jasminum sambac*(Fam. Oleaceae*), Punica granatum* (Punicaceae), *Apium graveolens* Linn. (Apiaceae), *Carmona retusa* (Boraginaceae), *Plectranthus scutellarioides* (Lamiaceae), *Senna alata* (Fabaceae)*, Orthosiphone aristatus*(Lamiaceae)*, Leucaena leucocephala* (Fabaceae), *Morinda citrifolia*

(Rubiaceae), *Andrographis paniculata* (Acanthaceae), and *Peperomia pellucida* (Piperaceae). The fourteen plant species have been noted to possess common folkloric pharmacological use such as anti-inflammatory, antimicrobial and antioxidant (Quisumbing, 1978). This study presents a summary of the phytoconstituents found in the selected medicinal plant species of the Philippines. The information provided in this study would support the scientific basis of the various folkloric uses of the fourteen plants that are commonly found in the Philippines and in some other countries. The study utilized locally grown plant samples in the Philippines that are commonly used by the Filipinos as a herbal remedy to various conditions.

**Methods**

A. Extraction

The fourteen plant materials were collected in various municipalities of Cavite, Philippines and Las Piñas, Metro Manila, Philippines. Every plant material used were locally grown and cultivated in the said collection areas. Approximately 300g of the leaves of each of the fourteen plant species were air-dried for two (2) weeks and pulverised to reduce the particle size prior to extraction. The pulverised plant materials were individually extracted through maceration using 80% hydroalcoholic solvent for a period of 48 hours. Each crude extract were concentrated using a steam bath at 40 degrees celsius until a syrupy consistency were achieved for each plant crude extract.

B. Phytochemical Screening

The methods described by Guevara, B. et. *al*. (2004) were followed for the qualitative phytochemical analysis of the fourteen plant crude extracts. Approximately 5mL of the concentrated extract for each plant species was utilised for the determination of the presence of every phytochemical constituent to be tested.

The fourteen crude extracts were tested for the presence of Alkaloids using Dragendorff's test as the primary identification test followed by Mayer's test as the confirmatory. The presence of Cardenolides were also tested using Keller-Killani test for the presence of deoxy sugars, Lieberman-Burchard test to confirm the presence of steroidal aglycone portion and ultimately the Kedde's test that is the confirmatory test for the presence of cardenolides. The fourteen crude extracts were also analysed for the presence of anthraquinone using Borntrager's test as the primary identification test and Modified Borntrager's test as the confirmatory test. The presence of Flavonoids were also detected in all the fourteen crude extracts using Bate-smith and Metcalf test and Wilstatter cyanidin test. Saponin detection was done using froth test, capillary tube test and Liebermann-Burchard test. The presence of tannins in every crude extract were also determined using gelatine test and ferric chloride test. The presence of cyanogenic glycosides were identified using picric paper test. Similar procedures were followed for the phytochemical analysis of every crude extract.

Qualitative identification was conducted to determine the presence of alkaloids, cardenolides, anthraquinones, flavonoids, saponins, tannins, and cyanogenic glycosides in all the fourteen crude extracts.

**Results and Discussion**

The results of the qualitative phytochemical screening have shown that a number of secondary metabolites or phytochemical constituents were found to be commonly present in most of the plant species being tested. Among the fourteen Philippine medicinal plant species, *L. speciosa, S. cumini, J. sambac, P. granatum, S. alata, O. aristatus, L. leucocephala,* and *M. citrifolia* contains alkaloid. The said plant materials have shown positsve results in both Dragendorff's and Mayer's test. A study done on the anti-inflammatory activity of 171 alkaloid have shown that 137 alkaloids out of 171 have significant anti-inflammatory activity ("Anti-inflammatory activity of alkaloids: a twenty-century review", 2016). The presence of cardenolides have been confirmed in *L. speciosa, P. amboinicus, P. granatum, L. leucocephala,* and *M. citrifolia.* The said plant materials have shown a positive result on all three tests used for the determination of cardenolides. Nonetheless, *S. cumini, O. aristatus, A. paniculata, S. alata,* and *C. retusa* have shown a positive result for only one or two out of the three test which indicates uncertainty of the presence of cardenolides, a possibility is that only a portion of the cardenolide was extracted on the said plant

materials. According to Tyler (1989), glycosides are easily hydrolysable which tends to result to a separated glycone and aglycone portion upon extraction.

Among the fourteen plant materials, only the *P. granatum* have shown a positive result for the presence of flavonoids. Previous literatures have cited *P. granatum* to possess significant pharmacological activities such as astringent, hemostatic, antimicrobial, antioxidant and blood tonic (Frawley, D. ,Lad, V. ,Santa, F., 1991). There were five (5) plant materials that contain Flavonoids among the fourteen tested plant extracts. Flavonoids are known to be one of the phytochemical constituents responsible in the free radical scavenging activity of most natural sources (Evans, 2009).The plants that have shown a positive result on both test for the presence of flavonoids were *P. amboinicus, J. sambac, P. granatum, O. aristatus,* and *M. citrifolia*.

Almost all the fourteen plant species have demonstrated a positive result for the three test for the presence of saponins except for *A. graveolens*, *O. aristatus*, *L. leucocephala*, and *M. citirofolia*. According to Weng, A., Thakur, Melzig, & Fuchs (2011), saponins are one of the phytochemical constituent that have been known to possess chemotherapeutic activity. The plant materials noted to certainly possess saponins could be a possible new prospect for chemotherapeutic studies.

There were only two plant species that do not contain tannins, *P. pellucida* and *O. aristatus*. Tannins have been known to exhibit astringent and antimicrobial activity. On the other hand, there were only four plant species that have shown to posses cyanogenic glycosides. The four plant species were *P. granatum, A. graveolens, S. alata,* and *P. pellucida*. Cyanogenic glycosides are derived from hydrocyanic acid which is a derivative of cyanide (Tyler, 1988). Plants that have possessed high levels of this secondary metabolites have been recorded to cause toxicity when ingested. The complete result of the study is presented on Table 1.

**Table 1.** Summary of the Phytochemical Analysis Result of the Fourteen medicinal plants of the Philippines

| TEST | PLANT MATERIALS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *L. speciosa* | *S. cumini* | *P. amboinicus* | *J. sambac* | *P. granatum* | *A. graveolens* | *C. retusa* | *P. scutellarioides* | *S. alata* | *O. aristatus* | *L. leucocephala* | *M. citrifolia* | *A. paniculata* | *P. pellucida* |
| ALKALOID | | | | | | | | | | | | | | |
| A. Dragendorff's | + | + | - | + | + | - | - | - | + | + | + | + | - | - |
| B. Mayer's | + | + | - | + | + | - | - | - | + | + | + | + | - | - |
| CARDENOLIDE | | | | | | | | | | | | | | |
| A. Keller-Killani | + | + | + | + | + | - | + | - | - | - | + | + | - | - |
| B. Liebermann-Burchard | + | - | + | + | + | - | + | - | + | + | + | + | - | - |
| C. Kedde | + | - | + | + | + | - | + | - | - | - | + | + | + | - |
| ANTHRAQUINONE | | | | | | | | | | | | | | |
| | - | - | - | - | + | - | - | - | - | - | - | - | - | - |
| | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

| TEST | PLANT MATERIALS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *L. speciosa* | *S. cumini* | *P. amboinicus* | *J. sambac* | *P. granatum* | *A. graveolens* | *C. retusa* | *P. scutellarioides* | *S. alata* | *O. aristatus* | *L. leucocephala* | *M. citriffolia* | *A. paniculata* | *P. pellucida* |
| A. Borntrager's B. Modified Borntrager's | | | | | | | | | | | | | | |
| FLAVONOID A. Bate-Smith & Metcalf B. Wilstatter Cyanidin | - - | - - | + + | + + | + + | + - | + - | - - | - - | + + | - - | + + | - - | - - |
| SAPONIN A. Froth test B. Ca | + + + | + + + | + + + | + + + | + + + | + - - | + + + | + + + | + + + | + - - | - - + | - - + | + + + | - - - |

| TEST | PLANT MATERIALS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *L. speciosa* | *S. cumini* | *P. amboinicus* | *J. sambac* | *P. granatum* | *A. graveolens* | *C. retusa* | *P. scutellarioides* | *S. alata* | *O. aristatus* | *L. leucocephala* | *M. citriffolia* | *A. paniculata* | *P. pellucida* |
| pillary tube C. Lieberman-Burchard | | | | | | | | | | | | | | |
| TANNIN A. Gelatin B. Ferric Chloride | + - | + - | + + | + + | + + | + - | + + | + + | + - | - - | + - | + - | + + | - - |
| CYANOGENIC GLYCOSIDE A. Picric paper | - | - | - | - | + | + | - | - | + | - | - | - | - | + |

The results of the qualitative phytochemical analysis have shown that the pharmacological effects that were known to the fourteen plant materials, such as antimicrobial, antioxidant, and anti-inflammatory effect, could be correlated to the secondary metabolites that have been noted to be present in the crude extracts from the leaves of the fourteen plant materials. Further studies on other pharmacological applications of the fourteen plant species can be conceptualized based on the results presented in this present study.

**Conclusion**

Based on the thorough phytochemical screening conducted in this present study, the common pharmacological activities of the fourteen medicinal plants of the Philippines can be correlated to the significant secondary metabolites present on the leaves of the said fourteen plant materials. Majority of the medicinal plants tested in this study contains active secondary metabolites namely alkaloids, saponins, and tannins that could be responsible to the common pharmacological activity such as antimicrobial, antioxidant, and anti-inflammatory.

**References**

Catibog-Sinha CS, Heaney LR. Philippine Biodiversity: Principles and Practice. Quezon City, Philippines: Haribon Foundation for the Conservation of Natural Resources, Inc. 2006.

Evans WC. Phytochemical Variations within Species. In: Trease and Evans Pharmacognosy. 16thEdition, Singapore; Saunders Elsevier, Inc.: 2009.

Quisumbing, E. Medicinal Plants of the Philippines. Quezon City, Philippines:Katha Publishing Co., Inc. 1978.

Guevara, B., et.al. A Guidebook to Plant Screening: Phytochemical and Biological. University of Santo Tomas, España, Manila, Philippines. 2004.

Frawley, D. ,Lad, V. ,Santa, F. ,'The yoga of Herbs"; Lotus press. New maximo Naqul SA, Khan Ms, Vohora SB.Antibacterial, antifungal and antihelmenthic investigations in indian Medicinal plants : Fitoterapia 1991.

Weng, A., Thakur, Melzig, & Fuchs,. (2011). Chemistry and pharmacology of saponins: special focus on cytotoxic properties. Botanics: Targets And Therapy, 19. http://dx.doi.org/10.2147/btat.s17261

Tyler, V.E. Pharmacognosy. USA: Lea and Febiger 1988.Anti-inflammatory activity of alkaloids: a twenty-century review. (2016). Retrieved 3 November 2016, from http://www.scielo.br/scielo.php?pid=S0102695X2006000100020&script=sci_arttext&tlng=pt