International Journal of Agricultural Technology 2022Vol. 18(2):771-778
Available online http://www.ijat-aatsea.com
ISSN 2630-0192 (Online)

Phytochemical screening of indigenous plants utilized by the Agta community in Aurora, Philippines

Rocha, P. P. V.,[1*] Gargabite, B. F. L,[1] Jacob, J. K. S.[1,2] and Abucay Jr., J. B. [1,3]

[1]Protein Chemistry and Biosensor Laboratory, New Science Bldg., Isabela State University, San Fabian, Echague Isabela, Philippines; [2]Department of Biological Sciences, College of Arts and Sciences, Isabela State University, San Fabian, Echague Isabela, Philippines; [3]Department of Chemistry, College of Arts and Sciences, Isabela State University, San Fabian, Echague Isabela, Philippines.

Rocha, P. P. V., Gargabite, B. F. L., Jacob, J. K. S. and Abucay Jr., J. B. (2022). Phytochemical screening of indigenous plants utilized by agta community in Aurora, Philippines. International Journal of Agricultural Technology 18(2):771-778.

Abstract Plants have long been recognized as a potential source of herbal and medicinal representatives before establishing modern and therapeutic medicine. The Philippines is home to a diverse range of indigenous flora communities, an essential source of ethnobotanical components. This study focused on detecting the phytochemical profile of indigenous plants to verify the folkloric beliefs of the Agta Community of *Bazal-Baubo* in Aurora, Philippines. Preliminary phytochemical screening revealed the presence of alkaloids, anthraquinone, flavonoids, glycosides, saponins, steroids, tannins, and terpenoids in the plants' ethanol extract, namely: *Manihot esculenta* (Euphorbiaceae), *Premna odorata* (Lamiaceae), *Terminalia macrocarpa* (Combretaceae), *Syzygium polycephaloides* (Myrtaceae), and *Urena lobata* (Malvaceae). The analysis confirmed that five indigenous plants utilized by the Agta community have a potential source of plant bioactive constituents. It is strongly recommended that pharmacological screenings and functionality of plant extract such as antimicrobial, anti-inflammatory, and antioxidant to validate plants' phytochemistry.

Keywords: Agta community, Aurora, *Bazal-Baubo*, Indigenous plants, Phytochemicals

Introduction

Various plants have been used to treat ailments in everyday life for many years worldwide. Plants have different bioactive substances, making them beneficial for multiple medications. According to the World Health Organization (WHO) in 2008, more than 80% of the world's population relies on traditional medicine for their primary healthcare needs (Benmehdi *et al.,* 2012). On a global scale, traditional medicines play a critical role the treating of health problems. In both modern and traditional medicine, medicinal plants continue to deliver essential therapeutic ingredients (Krentz and Bailey, 2005).

[*] **Corresponding Author**: Rocha, P. P. V.; **Email**: patrickrocha4444@gmail.com

The Philippines' Flora communities comprise around 12000 plant species, approximately 1500 of which are utilized in conventional medicine by indigenous peoples' traditional herbalists (Tantengo *et al.,* 2018; Dela Cruz and Ramos, 2006). Indigenous communities have used plants as remedies for a variety of diseases in the Philippines, ranging from common ones such as headaches, stomach problems, coughs, colds, toothaches, and skin diseases to more serious and fatal ones such as urinary tract infection, chickenpox, and dysentery (Balangcod and Balangcod, 2015). These plants' therapeutic properties are attributed to phytochemical components that have pharmacological effects on the human body (Doctor and Manuel, 2014; Akinmo-laudn *et al.,* 2007).

Knowledge on the use of plants as medicine was passed down from great ancestors through oral tradition. (Olowa *et al.,* 2012). In conclusion, herbal plants are still more important than ever for curing many common ailments, and the public has used them for a long time. However, as modernization advances, traditional knowledge and the use of therapeutic plants are at risk of extinction (Gruyal *et al*., 2014). Although several ethnobotanical research were conducted, many more medicinal plants warrant discovery and should be studied and tapped for scientific research for validation of medicinal uses (Balberona *et al.,* 2018). Hence, this study was conducted to detect secondary metabolites present in indigenous plants utilized by the Agta Community of *Bazal-Baubo* in Aurora, Philippines, as a source of herbal and therapeutic traditional medicine.

Materials and methods

Collection of plant samples

Healthy looking *Manihot esculenta* leaves and roots, *Premna odorata* leaves, *Terminalia microcarpa* leaves, *Syzygium polycephaloides* leaves and *Urena lobata* roots were obtained from the Agta Community of *Bazal-Baubo* in Aurora, Philippines. All plant parts were brought to the laboratory for identification and extraction process. Identification of the collected plant samples used for analysis was done by photo comparison using references from publish textbooks and literatures. Moreover, all reagents, chemicals, and solvents used were of analytical grade.

In advance of the extraction process, the collected samples were washed several times with tap water and rinsed with distilled water to remove dust, sand, and other foreign materials. After washing, the plant parts were carefully blot dried using sterile tissue paper. The dried samples were crushed into small pieces using Mortar and Pestle and pulverized using an electric osterizer until a soft and a fine powder is obtained. The ground samples were kept in dark glass bottles at a room temperature for further experimental procedures.

Subsequently, 5g of each powdered sample was transferred into a glass container, and a 50ml of 80% ethanol was added to each sample following a ratio of (1:10). The resulting mixture was covered and set aside for 24 hours. After soaking, the extract was filtered using a vacuum-assisted filtration set up with a Whatman No. 1 filter paper. The filtered organic solvent was concentrated using a water bath below 50 ℃ and stored in glass amber bottles for the qualitative analysis of phytochemical components.

Phytochemical screening

Preliminary phytochemical screening on the crude ethanol extracts of the five plants was performed following the protocols of Harborne (1998), Kokate (2005), Sofowora (1993) and Trease and Evans (1989). Each test was qualitatively stated as negative (-) or positive (+) and the concentration level of color and precipitate was expressed as +, ++ and +++.

Screening for alkaloids

Wagner's test. Each test tube containing 2ml of the extract was added with a few drops of Wagner's solution. The formation of reddish-brown precipitate indicates the presence of alkaloids.

Screening for anthraquinone

Approximately 0.2 of extracts were shaken with 4ml of benzene. After shaking, the mixture was filtered, and 2ml of 10% ammonia solution was added to the filtrate. The mixture was shaken thoroughly, and the presence of pink, red, or violet color in the ammoniacal (Lower) phase indicates the presence of free anthraquinones.

Screening for flavonoids

Alkaline reagent test. In a 2ml of each extract, a few drops of NaOH solution were added and observed. The formation of intense yellow color, which turns to colourless on the addition of few drops of diluted acid indicates the presence of flavonoids.

Screening for glycosides

Keller-Kelliani Test. Two (2) ml of the ethanolic extracts were added with 1ml of glacial acetic acid containing one drop of 5% $FeCl_3$. The mixture was carefully added with 0.5ml of concentrated sulfuric acid along the side of the test tube. The presence of brown ring indicates the presence of cardiac glycosides.

Screening for saponins

A 2ml of the extract was shaken vigorously with 2ml of distilled water and observed for foam formation. Frothing indicates the presence of saponins.

Screening for steroids

A 0.2g of each extract was dissolved in 2ml of chloroform and carefully added with concentrated sulfuric acid to form a lower layer. A reddish-brown color at the interphase indicates the presence of steroids.

Screening for tannins

Exactly 2 ml of distilled water and a few drops of $FeCl_3$ were added to the test extracts. Formation of brown or bluish black indicates the presence of tannins.

Screening for terpenoids

After shaking each extract with 1ml of chloroform, a few drops of concentrated sulfuric acid were added to form a lower layer. Formation of a red brown color indicates the presence of terpenoids.

Results

A total of five indigenous plants were recorded, collected, and processed for the phytochemical screening. The family, scientific name, local name, and plant part/s are presented in Table 1.

Table 1. Plant profile of indigenous plants utilized by the Agta Community of *Bazal-Baubo* in Aurora, Philippines

Family	Scientific name	Local name	Plant part/s used
Euphorbiaceae	*Manihot esculenta*	Kamoteng	Leaves
		Kahoy	Roots
Lamiaceae	*Premna odorata*	Asedaong	Leaves
Combretaceae	*Terminalia microcarpa*	Kalumpit	Leaves
Myrtaceae	*Syzygium polycephaloides*	Lipote	Leaves
Malvaceae	*Urena lobata*	Dalupang	Roots

The result of the preliminary phytochemical screening of five indigenous plants was conducted utilizing color forming and precipitating chemical reagents presented in Table 2. The phytochemical tests showed differences in concentration. Secondary metabolite concentration developed as an organic defense against pathogens, herbivores, and plants growing without nutrition or a striving environment.

Table 2. Phytochemical constituents of the ethanolic extracts of five selected plant samples

PHYTO-CHEMICAL	*M. esculenta* leaves	*M. esculenta* root peel	*P. odorata* leaves	*T. microcarpa* leaves	*S. polycephaloides* leaves	*U. lobata* roots
Alkaloids	+++	++	+++	+++	+++	+++
Anthraquinone	+	+	+++	++	++	+
Flavonoids	-	++	+	+++	+++	+++
Glycosides	+++	+	+++	++	++	++
Saponins	+++	+++	+	++	++	++
Steroids	++	+	++	+	+	+
Tannins	+++	++	++	++	+++	++
Terpenoids	+	+	++	++	++	++

The phytochemical analysis of five indigenous plants namely: *M. esculenta, P. odorata*, *T. microcarpa, S. polycephaloides, U. lobata* revealed the abundance in alkaloids, flavonoids, glycosides, saponins, and tannins while anthraquinone, steroids, and terpenoids were found in moderate to traceable amounts. However, the results also revealed the absence of flavonoids in *M. esculenta* leaves.

Discussion

The study showed the utilization of plants as sources of herbal and traditional medicine. The Agta Community of *Bazal-Baubo* in Aurora Philippines used the plants *M. esculenta. P. odorata, T. macrocarpa* and *S. polycephaloides* leaves extracts in boiling water to disinfect wounds, treat various skin diseases and stomach conditions and *U. lobata* as herbal tea. As reported by Afoakwa *et al*. in 2012, *Manihot esculenta* roots are a significant staple food as a good source of fiber and carbohydrates.

Different concentration of secondary metabolites was found in the plant extracts. The concentration of phytochemical alkaloids appears abundant in all plant extracts. The secondary metabolite alkaloids are common in higher species of plants (Murphy, 2017) and used in medicines for reducing headaches and fevers in Wistar rats. Alkaloids, flavonoids, saponins, tannins, and terpenoids possess an antimicrobial property which helps to disinfect wounds and treat skin diseases (Bahekar and Kale, 2015) (Krishnaiah *et al.*, 2007) (Rievere *et al*., 2009) (Tsumbu *et al*., 2011). At low concentrations, tannins can inhibit the growth of microorganism, and act as an antifungal agent at higher concentration by coagulating the protoplasm of the microorganism (Adekunle and Ikumapayi, 2006).

All plants species utilized by the Agta Community of *Bazal-Baubo* revealed an interesting medicinal value that takes part in traditional use of herbal medicine for treating various diseases. The selected five indigenous plants are a good source of secondary metabolite, i.e., alkaloids, anthraquinone, flavonoids, glycosides, saponins, steroids, tannins, and terpenoids, shows medicinal value and importance in human consumption. The collected medicinal plants utilized by indigenous communities highlight the value of protecting and conserving the folkloric beliefs and indigenous plant species, given environmental importance and therapeutic value.

Acknowledgements

The authors are thankful for the support of materials, facilities, and equipment by the Protein Chemistry and Biosensor Laboratory and Department of Biological Sciences of Isabela State University- Echague Main Campus.

References

Adekunle, A. A. and Ikumpayi, A. M. (2006). Antifungal Property and Phytochemical Screening of the Crude Extracts of *Funtumia elastica* and *Mallotus oppositifolius*. West Indian Medical Journal, 55: 219-223.

Afoakwa, E. O., Asiedu, C., Budu, A. S., Chiwona-Karltun, L. and Nyirendah, D. B. (2012). Chemical composition and cyanogenic potential of traditional and high yielding CMD resistant cassava (*Manihot esculenta* Crantz) varieties, International Food Research Journal, 19:175-181.

Akinmo-laudn, A. C., Ibukun, E. O., Afor, E., Obuotor, E. M. and Farombi, E. O. (2007). Phytochemical constituents and antioxidant activity of extracts from leaves of *Ocimum gratissimum*, Scientific Research and Essays, 2:163-166.

Bahekar, S. E. and Kale, R. S. (2015). Antidiarrheal activity of ethanolic extract of *Manihot esculenta* Crantz leaves in Wistar rats. Journal of Ayurveda and integrative medicine, 6:35-40. https://doi.org/10.4103/0975-9476.146542

Balangcod, T. D. and Balangcod, K. D. (2015). Ethnomedicinal Plants in Bayabas, Sablan, Benguet Province, Luzon, Philippines, Electronic Journal of Biology, 11:63-73.

Balberona, A. N., Angeles, M. G. B., Cachin, E. J. D. J., Cruz, K. G. J., Noveno, J. J. and Santos, R. I. (2018). Ethnomedicinal Plants Utilized by the Ilongot-Egongot Community of Bayanihan, Maria Aurora, Aurora, Philippines. International Journal of Agricultural Technology, 14:145-159. Available online. http://www.ijat-aatsea.com ISSN 2630-0192.

Benmehdi, H., Benali, O., Hasnaoui, O. and Salhi, F. (2012). Phytochemical investigation of leaves and fruits extracts of *Chamaerops humilis* L. J. Mater. Environmental science, 3:320-237.

Dela Cruz, P. and Ramos, A. (2006). Indigenous Health Knowledge Systems in the Philippines: A Literature Survey. Paper presented at the 13th CONSAL Conference, Manila, Philippines.

Doctor, T. R. and Manuel, J. F. (2014). Phytochemical Screening of Selected Indigenous Medicinal Plants of Tublay, Benguet Province, Cordillera Administrative Region, Philippines. International Journal of Scientific and Research Publications, Volume 4, Issue 4, April 2014 1 ISSN 2250-3153.

Gruyal, G. A., Del Rosario, R. and Palmes, N. (2014). Ehno-medicinal plants used by residents in Northern Surigao, del Sur, Philippines. Natural Products Chemistry and Research.

Harborne, J. B. (1998). Textbook of Phytochemical Methods. A Guide to Modern Techniques of Plant Analysis. 5th Edition, Chapman and Hall Ltd, London, 21-72.

Krentz, A. J. and Bailey, C. J. (2005). Oral antidiabetic agents: current role in type 2 diabetes mellitus. Drugs, 65:385-411.

Kokate, C. K. (2005). A Textbook of Practical pharmacognosy, 5th Edition, Vallabh Prakashan, New Delhi, pp.107-111.

Krishnaiah, D., Bono, A. and Sarbatly, R. (2007). Phytochemical antioxidants for health and medicine: A move towards nature. Biotechnology and Molecular Biology Reviews, 1:97-104.

Murphy, D. J., Thomas, B. and Murray, B. G. (2017). Encyclopedia of Applied Plant Sciences (Second Edition). Amsterdam; Boston: Elsevier Academic, pp. 118-124.

Olowa, L. F., Aranico, E. C., Demayo, C. G. and Torres, M. A. (2012). Medicinal plants used by the higaonon tribe of Rogongon, Iligan City, Mindanao, Philippines. Advances in Environmental Biology, 6:1442-1449.

Rievere, C., Dejaegher, B., Heyden, Y. V., Minh, C. V., Pieters, L., Quetin-Leclercq, J. and Van Nguyen, T. H. (2009). Polyphenols isolated from antiradical extracts of *Mallotus metcalfianus*. Phytochemistry, 70:86-94.

Sofowora, A. (1993). Medicinal Plants and Traditional Medicine in West Africa. Spectrum Books Limited., Ibadan, pp.191-289.

Tantengo, O. A., Condes, M. L., Estadilla, H. H. and Ragragio, E. (2018). Ethnobotanical Survey of Medicinal Plants used by Ayta Communities in Dinalupihan, Bataan, Philippines. Pharmacognosy Journal, Vol 10, Issue 5.

Trease, G. E. and Evans, W. C. (1989). Pharmacognosy 11th Edition; Brailliar Tiridacanb Macmillian Publishers.

Tsumbu, C. N., Angenot, L., Deby-Dupont, G., Franck, T., Mouithys-Mickalad, A., Serteyn, D. and Tits, M. (2011). Antioxidant and Antiradical Activities of *Manihot esculenta* Cranz (Euphorbiaceae) Leaves and Other Selected Tropical Green Vegetables Investigated on Lipoperoxidation and Phorbol-12-myristate-13-acetate (PMA) Activated Monocytes. Nutrients, 3:818-838. https://doi.org/10.3390/nu 3090818

(Received: 13 October 2021, accepted: 10 February 2022)