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ETHNOBOTANICAL, CHEMICAL PROFILE AND ANTIMICROBIAL ACTIVITY OF PITCHER PLANT (*Nephentes bellii*)

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ABSTRACT

The study determined the process how the medical process and utilization of pitcher plant *(Nephentes bellii)*. This is a descriptive- investigative study where it pursued to investigate facts and accurate data. The respondent includes forty-five (45) individuals who manifest knowledge in using the plant as an herbal medicine. Specific, plant parts were gathered from three different sites, namely: Baranggay Cabangahan from municipality of Cantilan and Baranggay Bon.ot and Adlay from the municipality of Carrascal. The plant samples were subjected to laboratory analysis to determine its chemical components and its antimicrobial property. As it is the main objective of the study. All the assays mentioned were done at the Department of Science and Technology Testing Laboratory.

Findings revealed that majority of the respondents used Leaves and Pitcher of the plant as herbal medicine. Decoction and Infusion were the most common method in preparing the herbal plant. Frequent urination is the most common condition identified on the utilization of pitcher plant as herbal medicine. The chemical analysis showed that pitcher plant *(Nephentes bellii)* leaves and pitcher contain phytochemical essential for treating different diseases, likewise the result of the microbial analysis showed a "very active" rating.

KEYWORDS: Pitcher plant (*Nephentes bellii)*, Chemical Profile, Antimicrobial Activity

I. INTRODUCTION

Different species of pitcher plant have long been used as traditional medicine by many aboriginal communities, and have attracted renewed pharmaceutical interest due to recent investigations revealing their cytoprotective activities in cell models (Harris 2012). A species of pitcher plant Nepenthes bellii is endemic to the Philippines. It is popular on Dinagat and northern Mindanao; and was discovered on a trip to the Philippines by Katsuhiko Kondo in 1968 (McPherson, 2009).Together with other known species of *Nephentes* genus, *Nephentes* bellii has been one of the plants that are used as an alternative medicine to treat constipation, urinary tract problems, digestion problems, fluid retention, and other conditions (Cakilcioglu and Turkoglu 2010). In North America, the plant has a history of use as both a marketed pain therapy and a traditional medicine in many aboriginal communities. Preparations of the leaves and the plant's long slender pitchers became known to be beneficial in treating symptoms of diabetes, and in particular slow healing infections (Leduc, et al. 2006).

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In a report by the International Union for Conservation of Nature (IUCN), *Nephentes belli* a species of a pitcher plant is now considered as endangered due to habitat loss caused by human activities (McPherson 2009). However, the population of Nepenthes bellii has never been estimated accurately, but is thought to number in thousands, as it is present in northeastern Mindanao Clarke et al., (2000)

The scenarios described above motivate the researcher to conduct this study especially that the results provides sufficient information about the benefits can be obtained to the pitcher plant (*Nephentes bellii*) specifically in the medicinal aspect. The purpose of the research was to determine how the pitcher plant (*Nephentes bellii*) is used as herbal medicine; the part of the plant to being used, the plant preparation and the specific conditions to be treated. Likewise, validating the phytochemicals in the leaves and pitchers of the pitcher plant and testing its antimicrobial activity. In addition, species protection is also taken into account by community education, recognizing that the plant is endemic in the area and threatened for possible extinction.

This study is anchored to the Optimal Foraging Theory that predicts (1) individuals will place higher value on plants that yield more benefit per unit of foraging/processing time; (2) as the abundance of plants with higher value increases, plants with lower value will no longer be used; and (3) individuals should have a quantitative threshold to decide when specific plants should be included or excluded (Sih and Christensen 2001).

II. METHODOLOGY

The research used a descriptive-investigative model in which details and accurate data were examined. The respondents include forty-five (45) people who are familiar with the use of the plant as a herbal medicine in the following areas: Baranggay Cabangahan from Cantilan Municipality and Baranggay Bon.ot and Adlay from Carrascal Municipality. The accepted questionnaire checklist was used to determine the mode of preparation of the herbal plant by the participants, the portion of the plant being used and the particular conditions being treated. The plant samples from three identified sites were sent to the DOST-testing laboratory for phytochemical screening and antimicrobial assay to ensure the validity and efficacy of the procedure. The procedure that was used for the aforementioned test is based on the Regional Standard and Testing laboratory of Department of Science and Technology.

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III. RESULT

Table 1. The Herbal plant utilization for medicinal value in its parts, mode of preparation and ailment treated

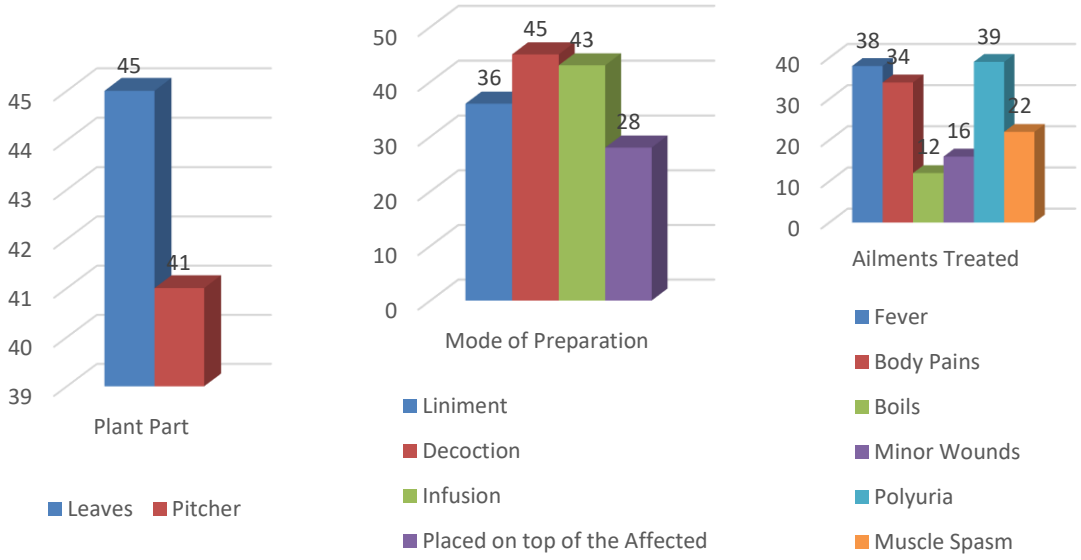

Table 2. Phytochemical constituents present in pitcher plant leaves and pitchers from three different sites

Site	Plant Part	Parameter				
		Alkaloids	Steroids	Flavonoids	Saponins	Tannins
A Cabangahan	Leaves	++	+	+	-	+
	Pitcher	++	+	+	-	+
B. Bon.ot	Leaves	++	+	+	-	+
	Pitcher	++	+	+	-	+
C. Adlay	Leaves	++	+	+	-	+
	Pitcher	++	+	+	-	+

Legend: (+) Present (-) Absent

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Table 3. Microbial analysis result

Site	Plant Part	*E.coli* (Gram -) mean result in mm	*S. aureus* (Gram +) mean result in mm
Site A (Cabangahan)	**Leaves**	16	19
	Pitcher	25	25
Site B (Bon-ot)	**Leaves**	16	22
	Pitcher	24	20
Site C (Adlay)	**Leaves**	16	19
	Pitcher	21	22

Legend: < 10mm – inactive, 10-13mm- partially active, 14-19 mm active, >19mm very active

IV. DISCUSSION

Table 1. Shows that all of the 45 respondents used the leaves for the most common part of the plant and 41 or 91 percent used pitcher. The finding is verified by Gruyal's research (2016) when she announced that the leaves are the most commonly used as medicine in Surigao del Sur. The most common method of preparing herbal medicine is decoction and infusion in the preparation mode. The result can be attributed to the study on the Temuans by Ong et al. (2011) and on the Malay villagers by Ong and Nordiana (1999), the very common preparation method was to boil the plant part or decoction until a desired concentration was achieved. In addition, the most common ailment the herbal plant treats is: polyuria or urinary frequency, bus-aw as they usually say, with a response of 39 or 87 percent from the total respondents.

Table 2. Above displays the three leaves and pitcher extract samples varying from different sites showed the exact same results from the phytochemical analysis. Alkaloids, Steroids, Flavonoids, and Tannins are present in the extracts, while the absence of Saponins is observed. Amirkia (2014) stressed that alkaloids have a wide range of pharmacological activities including antimalarial, anticancer, analgesics and antibacterial. Steroids can spur healing in burn patients. Some types of steroids are used to reduce inflammation. The drugs used to treat asthma attacks are a form of steroid (McGwire 2010). Meanwhile flavonoids are well known as antibacterial agents against a wide range of pathogenic microorganism, it attracted much interest because of the potential to be substitutes for antibiotics (Xie et al., 2015). The absence of Saponins clearly shows that Pitcher plant *(Nephentes bellii)* is safe for human consumption as herbal medicine. Saponins is toxic compound and can be found in many plants (Hostettmann and Marston, 1995).

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Results in table 3. Shows different types of bacteria also cause different types of infections, and different types of antibiotics are effective against them (Bush 2018). This statement postulates positive impact to pitcher plant as an antimicrobial agent. Based from the chemical analysis result, pitcher plant contains phytochemical that are essential for human health, likewise in the microbial analysis conducted to both gram positive and gram negative bacteria the result is promising as evidence of reaching the very active level as per interpretation in the result. These outcomes prove the coherence why the respondents utilized pitcher plants (Nephentes belli) treating different ailments since the result in microbial analysis shows the effectiveness of pitcher plant in inhibiting the growth of both gram positive and gram negative bacteria.

V. CONCLUSION

Since then, the respondents have been practicing herbalism because they know different methods of herbal plant preparation. Their planning means are based on their ancestors ' inherited expertise. Pitcher plant *(Nephentes bellii)* produces phytochemicals that are useful as a medicine and have the ability to kill micro-organisms. Lastly, Pitcher plant *(Nephentes bellii)* originating from different sites does not matter in terms of its antimicrobial activity, but results depending on the bacteria type.

VI. REFERENCES

Adam J H, Omar R, Wilcock C C. phytochemical screening of flavonoids in three hybrids of nepenthes (nepenthaceae) and their putative parental species from Sarawak and Sabah. Online Journal of Biology Sciences, 2002, 2(9):623-625

Amirkia, V., & Heinrich, M. (2014). Alkaloids as drugs leads-A predictive structural and biodiversity-based analysis. Phytochemistry letters 10, xlviii-liii. Retrive on March 5,2016, from http://www.Sciencedirect.com /science /article /pii/ S187 439 0014 00113X

Anderson, D.M., Salick, J., Moseley, R.K. and Xiaokun, O. (2005). Conserving the sacred medicine mountains: A vegetation analysis of Tibetan sacred sites in Northwest Yunnan. Biodiversity and Conservation 14: 3065–3091.

Bernhoft, A. (2010). Bioactice compounds in plants benefits and risks for man and animals. DetNorske Videnskaps-Akadimi.Retrieved from http: /www.dnva.no/ binfil /download.php?tid=48777

Bush, L. (2018). Overview of Gram-Positive Bacteria https:// www. Msdmanuals .com/home/infections/ bacterial-infections-gram-positive-bacteria/overview-of-gram-positive-bacteria

Cakilcioglu, U. and Turkoglu, I. (2010). An ethnobotanical survey of medicinal plants in Service, Journal of Ethnopharmacology, vol. 132, no. 1, pp. 165–175.

Chew YL, Chan EWL, Tan PL, Lim YY, Stanslas J and Goh JK.(2011) Assessment of phytochemical content, polyphenolic composition, antioxidant and antibacterial activities of Leguminase medicinal plants in Peninsular. BMC complementary Altern Med.

Cheek, M.R. & M.H.P. Jebb (2001). Nepenthaceae. Flora Malesiana 15: 1–157 Retrieved from http: /www.dnva.no/ binfil /download.php?tid=48777

ISSN: 2582-6271

Vol.1 No.2; 2020

Clarke,C.;Cantley, R.;Nerz, J.; Rischer, H.; Witsuba, A. (2000). "Nepenthes bellii". IUCN RedListofThreatenedSpecies.IUCN. 2000:e.T39645A10253911. doi:10.2305/IUCN.UK.2000.RLTS.T39645A10253911.en. Retrieved 18 March2017.

Chung, K. T., Wong, T. Y., Wei, C. I., Huang, Y. W., & Lin, Y. (1998). Tannins and human health: a review. Critical reviews in food science and nutrition, 38(6), 421-464. Retrieve on March 6, 2016, from http://www.ncbi.nlm.nih.gov/pubmed/9759559

Dong, J. E., Ma, X. H., Wei, Q., Peng, S. B. & Zhang, S. C. (2011). Effects of growing location on the contents of secondary metabolites in the leaves of four selected superior clones of Eucommia ulmoides. Ind. Crop Prod. 34, 1607–1614

Francis G, Kerem Z, Harinder P S M, Klaus B. The biological action of saponins in animal systems: A review. British Journal of Nutrition, 2002, 88(6):587-605

Harris CS, Asim M, Saleem A, Haddad PS, Arnason JT, Bennett SAL.(2012). Characterizing the cytoprotectiveactivity of Sarracenia purpurea L., a medical plant that inhibits glucotoxicity in PC12 cells. BMC Comple-ment Altern Med.

Hosseinzadeh H, Karimi G, Niapoor M.(2015) Antidepressant effect of Crocus sativus L stigma extracts and their constituents, crocin and safranal, in mice. Acta Hort. 2004;650:435–45

Hostettmann, K.; A. Marston (1995). Saponins. Cambridge: Cambridge University Press. p. 3ff. ISBN 978-0-521-32970-5. OCLC 29670810.

Kevat,D. (2013). Jackfruit Health Benefits and Nutririon Facts.Retrieve on August 22, 2015, from http://wiki -fitness.com/jackfruithealth-benefits-nutrition-facts/http:// www .disabledworld. om/medical/supplements/antioxidants/fla vonoids. php Retrieve on March 6, 2016 http:// www.thelivingcentre.com/cms/our-services/herbalism

Kondo, K. (1969). A New Species of Nepenthes from the Philippines Bulletin of the Torrey Botanical Club, Vol. 96, No. 6 (Nov. - Dec., 1969), pp. 653-655 Published by: Torrey Botanical Society Stable URL: http://www.jstor.org/stable/2483544 Accessed: 16-01-2016 23:54 UTC.

Krol, E.; Plancho, B.J.; Adamec, L.; Stolarz, M.; Dziubinska, H.; Trebacz, Kgv (2011)."Quite a few reasons for calling carnivores 'the most wonderful plants in theworld".AnnalsofBotany.109(1):4764.doi:10.1093/aob/mcr249. PMC 3241575 PMID 21937485.

Kuklinski,C.F.(2000).FarmacognosiaOmegaSA.Retrievedfrom:https://pdfs.semanticscholar. org / 85e1/50749a62cc 7163fc017096c820060e13008d. pdf

Lanski SL, Greenwald M, Perkins A, Simon HK:(2003). Herbal therapy use in a pediatric emergency department population: expect the unexpected. Pediatrics. 111 (5 Pt 1): 981-985.

Leduc C, Coonishish J, Haddad P, Cuerrier (2006). A Plants used by the cree nation of eeyou istchee (quebec, canada) for the treatment of diabetes: a novel approach in quantitative ethnobotany. J Ethnopharmacol.

ISSN: 2582-6271

Vol.1 No.2; 2020

Lowy, F. (2009). Gram Negative vs Gram Positive Bacteria. Retrieved from http://www. Diffen.com/difference/Gram-negative_Bacteria_Vs_Gram- positive_ Bacteria

Oldfield,S (2010). Plant Conservation: Facing Tough Choices BioScience, Volume 60, Issue 10, 1 November 2010, Pages 778 779,https://doi.Org/10 .1525/bio.2010.60.10.2

Otang W.M., Grierson D.S., Ndip R.N (2012). Phytochemical studies and antioxidant activity of two South African medicinal plants traditionally used for the management of opportunistic fungal infections in HIV/AIDS patients. BMC Comp. Alter. Med. 12: 12-43

Mauseth, James (2008). Botany: An Introduction to Plant Biology. Jones and Bartlett Publishers. p. 596. ISBN 0-7637-5345-9.

McGwire M. (2010). Steroids: the risk & benefits. Retrieve on March 10, 2016, from http://articles.sun-sentinel.com/2010-01-18/health/sflsteroidsdebate-011510_1_ r o id - rage-steroids-are-synthetic-versionstestoren

McKey D. (1979). The distribution of plant secondary compounds within plants. In: Rosenthal GA, Janzen DH (eds) Herbivores: their interactions with secondary plant metabolites. Academic press, New York, pp 55–133

McPherson, S.R. (2009). Pitcher Plants of the Old World. 2 volumes. Redfern Natural History Productions, Poole.

Maliene V, Grigonis V, Palevičius V, Griffiths S (2011). "Geographic information system: Old principles with new capabilities". Urban Design International. pp. 1–6. doi:10.1057/udi.2010.25.

Goodchild, M. F. (2010). "Twenty years of progress: GIScience in 2010". Journal of Spatial Information Science

Gruyal, G.A. (2016). Identification,phytochemical analysis and Antioxidant capacities of ethnomedicinal plants used in Northern Surigao del Sur, Philippines Potential Alternative Medicine

Parveen, N., Nayak, S., Kar, D. M., & Das, P. (2010). Pharmacological evaluation of ethanolic extracts of the plant Alternanthera sessilis against temperature regulation. Journal of Pharmacology Research. 3(6), 1381-1383.

Pritchard l. (2002). "Evolutionary adaptations in pitcher plants". International Journal of Evolutionary Biology. 12 (3): 62–81.

Philippine Herbal plants (2014). List of medicinal Plants in the Philippines. Retrieved from http:/ www.philippineherbalmedicine.org/medicinal_plants.htm

Priyanga S, Hemmalakshmi S, Sowmya S, Vidya B, Chella Perumal P, Gopalakrishnan VK, Devaki K. (2015). In vitro enzyme inhibitory evaluation and free radical scavenging potential of ethanolic leaf extract of Macrotyloma uniflorum (L.). Int J of Cur Pharm Rev and Res, 6:169-177.

Rischer H, Hamm A, and Bringmann G. (2002). Nepenthes insignis uses a C2-portion of the carbon skeleton of L-alanine acquired via its carnivorous organs, to build up the allelochemical plumbagin. Phytochemistry 59, 603–609.

ISSN: 2582-6271

Vol.1 No.2; 2020

Rodzali N N, Mydin M M. Antibacterial activity of leaves and pitchers extract of nepenthes gracilis against bacillus subtilis and escherichia coli. J. Fundam. Appl. Sci., 2017, 9(6S), 81-88.

Rogers,T.(2018).Facts about Pitcher Pants. Retrieved from https:// sciencing.com /pitcher-plant-5385098.html on 03.10.'18.

Roy, P.S. and Behera, M.D. 2005. Assessment of biological richness in different altitudinal zones in the Eastern Himalayas, Arunachal Pradesh, India. Current Science 88: 250-257

Sarma, S. 2017. Importance of plants in our life. DBT-Research Associate IICSIR-Centre for Cellular and Molecular Biology (CCMB)Uppal Road, Hyderabad-500007, India

Sih A, & Christensen B. (2001). Optimal diet theory: When does it work and when and why does it fail? Anim. Behav.;61:379–390

Sowmya S, Chella Perumal P, Anusooriya P, Vidya B, Pratibha P, Gopalakrishnan, V. K. In vitro antioxidant activity, in vivo skin irritation studies and HPTLC analysis of Cayratia trifolia (L.) Domin. Int J Toxicol Pharm Res, 2015; 7:1-9.

Supriya S, 2018-Research Associate IICSIR-Centre for Cellular and Molecular Biology (CCMB)Uppal Road, Hyderabad-500007, India

Tariq, A. L., & Reyaz, A. L. (2013). Significance and importance of the phytochemicals present in Terminalia chebula. International Journal of Drug Development and Research. 5(3), 256-262.

Tilman D,& Lehman C (2001) Human-caused environmental change: Impacts on plant diversity and evolution. Proc Natl Acad Sci USA 98(10):5433–5440.

Wilschut, L.I; Laudisoit, A.; Hughes, N.K; Addink, E.A.; de Jong, S.M.; Heesterbeek, J.A.P.; Reijniers, J.; Eagle, S.; Dubyanskiy, V.M.; Begon, M. (19 May 2015). "Spatial distribution patterns of plague hosts: point pattern analysis of the burrows of great gerbils inKazakhstan". JournalofBiogeography. 42 (7):12811292. doi:10.1111/jbi.12534. PMC 4737218.

World Health Organization. Traditional Medicine Strategy 2014-2023.2014fr: http: llapps .who.int7irislbitstream710665l92455l1l9789241506090eng.pdf?ua=1

Xie Y, Yang W, Tang F, Chen X, Ren L (2015), Antibacterial activities of flavonoids: structure- activity relationship and mechanism https://www. ncbi. nlm.nih.gov /pubmed/ 25245513

Yang, X., Skidmore, A.K., Melick, D.R., Zhou, Z. and Xu, J. (2006). Mapping non-wood forest product (matsutake mushrooms) using logistic regression and a GIS expert system. Ecological Modeling 198: 208–218.

Yabe, S.; Aiba, Y.; Sakai, Y.; Hazaka, M.; Yokota, A. (2010). "Thermogemmatispora onikobensis gen. nov., sp. nov. And Thermogemmatispora foliorum sp. nov., isolated from fallen leaves on geothermal soils, and description of Thermogemmatisporaceae fam. Nov. And Thermogemmatisporales ord. Nov. Within the class Ktedonobacteria". International Journal of Systematic and Evolutionary Microbiology. 61 (4): 903–910

ISSN: 2582-6271

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Zangerl A.R, and Rutledge CE (1996) The probability of attack and patterns of constitutive and induced defence: A test of optimal defence theory. Am Nat 147:599–608

Zhu F. (2011) Clustered patterns of species origins of nature-derived drugs and clues for future bioprospecting. Proc Natl Acad Sci USA 108(31):12943–12948