CMU Journal of Science
The Official Scientific Journal of Central Mindanao University
ISSN Print: 0116-7847 js.cmu.edu.ph ISSN Online: 2704-3703

Research Article

Assessment of Plants and Conservation Status for Commodification of Local of Brgy. Bukangliwayway, Kibawe, Bukidnon, Philippines

Merced G. Melencion [1,2,3*], Maria Melanie M. Guiang[1,2,3], Fulgent P. Coritico[1,2,3], Hannah P. Lumista[1], Vince R. Abarquez[1], Chris Rey M. Lituañas[1], Marilag T. Mateo[1], Rasel A. Lacandula[1], Christina Joy O. Lahayhay[1,3], Florfe M. Acma[1,2,3]

[1] Institute of Biological Sciences, College of Arts and Sciences, Central Mindanao University, Musuan, Maramag, Bukidnon, Philippines, 8714
[2] Microbiology Laboratory, Natural Sciences Research Center, Central Mindanao University, Musuan, Maramag, Bukidnon, Philippines, 8714
[3] Center for Biodiversity Research and Extension in Mindanao, Central Mindanao University, Musuan, Maramag, Bukidnon, Philippines, 8714

* Correspondence: Merced G. Melencion: merced_gutierrez12@yahoo.com

Citation: Melencion M, Guiang M, Coritico F, & et al. (2024). *"Assessment of Plants and Conservation Status for Commodification of Local of Brgy. Bukangliwayway, Kibawe, Bukidnon, Philippines."* CMU Journal of Science. 28(1), 52

Assigned Editor: Dr. Alma Mohagan

Received: May 13. 2022
Revised: March 13, 2024
Accepted: March 18, 2024
Published: July 31, 2024

Copyright: © 2024 by the authors. Submitted for possible open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (https://creativecommons.org/licenses/by/4.0/).

ABSTRACT

Preliminary assessment of Brgy. Bukangliwayway revealed that the natural forest stands have been denuded leaving only scanty forests fragments which may still contain indigenous plants of the locality. Thus, this paper provides the lists of plants with emphasis on their conservation and propagation protocol of selected endemic and indigenous economic species of plants as a form of *ex situ* conservation. Field exploration and a transect survey with two (2) sampling sites were established in the area. The wildlings of the four species such as *Adiantum capillus-veneris* L., *Artocarpus ovatus* Blanco, *Lygodium circinnatum* (Burm.f.) Sw. and *Mischocarpus* sp. were collected for *ex situ* conservation. There were 123 species under 112 genera and 58 families were listed. Assessment of the species revealed two (2) Endangered (EN), four (4) Vulnerable (V), two (2) Other Threatened (OTS), three (3) Near Threatened (NT) and thirty-five (35) Less Concerned (LC) plant species while fourteen (14) endemic species were documented. Six (6) *A. capillus-veneris*, eleven (11) *A. ovatus*, three (3)
L. circinnatum and fifty-four (54) *Mischocarpus* sp. wildlings were propagated. *Mischocarpus* sp showed highest survival rate implying the great potential of the species to be mass propagated. Since Bukangliwayway harbors a number of threatened and endemic species, it is recommended that the remaining forests be conserved and *in-situ* conservation must also be implemented.

Keywords: conservation initiatives, commodification, Bukangliwayway, endemic

INTRODUCTION

Preliminary survey of Brgy. Bukangliwayway indicated that the natural forest areas have been depleted, resulting in only sparse remnants of forest, which may still harbor indigenous plants native to the area. Being a far-flung barangay, it is assumed that local people utilize these indigenous plants for their daily sustenance but these useful plants may have been depleted due to unsustainable ways of utilization. It is along this premise that this study will look into to identify and document these indigenous plants and offer protocols in the conservation and in the propagation of these plants for use of the community.

Many species of plants have been reported as possible sources of food, herbal medicines, as well as ingredients for soap, lotion and powder (de Winter and Amoroso, 2003; Benjamin and Manickam, 2007; Gediya et al., 2011). Amoroso et al. (2016) reported 10 edible species of ferns to have relatively high antioxidant activity as well as relatively high protein content. Other species of edible ferns were also reported by Copeland (1942), Thakur et al. (1998), Shin (2010) and Wei (2010). Furthermore, there are also reports on other pteridophyte species with antioxidant activity (Carcia et al., 2006; Chen et al., 2007; Ding et al., 2008; Shin and Lee, 2010; Chai et al., 2013), antimicrobial (Singh et al., 2008; Amit, 2011) and antidiabetic (Chai et al., 2012, 2014, 2015). Some species of pteridophytes also contain ecdysteroids which can regenerate cell, refine skin texture and strengthen skin barrier (Lafont and Dinan, 2003), and can inhibit propionibacterium acnes (Kim et al., 2006). Even spores of ferns were added to cosmetic products such as facial scrub (Jin et al., 2005) and face mask, powder foundation and compact powder (Choudhry et al., 2014).

Green plants produce the most fundamental sustenance for all organisms. It provides people's basic needs like food, shelter, fiber, medicine and fuel. Plants are the only source of food and oxygen; no animal can provide these by itself. Plant resources are used for obvious purposes such as shelter in the form of wood for houses and clothing in the form of cotton fibers. In addition to these concrete aspects of the plant world, people must consider the value and protect the beauty and tranquility derived from plants (Fernando, 2012). The United Nations Convention on Biological Diversity (CBD) (Uprety, 2012) sustainable use of its components; and a fair and equitable sharing of the benefits from the use of genetic resources (Arquion et al., 2015). However, there is limited information about the economic use of indigenous plants in the country. To address this concern, there is a need to conduct survey on economically important species of plants and explore its potential as food, medicine and ornamental and eventually become the source of income and will serve as alternative livelihood of the local people in the area.

Since there is still no database on the status of endemic plants in Bukangliwayway, this study aims to conduct an inventory and assessment of plants to harness the traditional knowledge, promote sustainable practices, and advanced scientific research for the benefit the community. Specifically, it aims to classify and identify the indigenous economic plants present in the area, assess the ecological and conservation status of the species and propagate selected indigenous economic species of plants as a form of *ex situ* conservation and ethnopharmaceutical potential.

METHODOLOGY

Prior Informed Consent (PIC). To satisfy the legal requirements of EO 247 (Bioprospecting) and RA 9147 (Wildlife Resources Conservation and Protection Act), prior informed consent (PIC) from the community was obtained and presented to the members of the Barangay Officials of Brgy. Bukangliwayway, Kibawe, Bukidnon for their approval. Bukangliwayway is one of the barangays in the municipality of Kibawe, Bukidnon. It lies in coordinates of 7.4936 N, 125.0242 E and elevation of 161.9 meters above sea level (Philatlas, 2015). Gratuitous Permit from the Department of Environment and Natural Resources Region X was also secured. Figure 1 shows the map of the Bukangliwayway, Kibawe, Bukidnon, Philippines.

Field sampling, inventory, collection, processing & identification of plants (Amoroso et. al., 2011; Suba et al., 2019). Field exploration and a transect survey was conducted in Barangay Bukangliwayway, Kibawe, Bukidnon last January 13, 2021 and April 12-13, 2021 to survey and describe the vegetation types. Likewise, the altitude, location and other ecological parameters. A GPS was used to determine the location of each vegetation type. Two sampling sites were established in the area. One of the sampling sites was located in the partially disturbed forest area while the other one was established within the community. Transect walks were done to record the different economic species of plants in the two sites. Representatives of the plants were collected, pressed, dried and mounted as herbarium vouchers following the standard procedures. The specimens were preliminarily identified using available literatures such as Co's Digital Flora of the Philippines (Pelser et al., 2018 onwards).

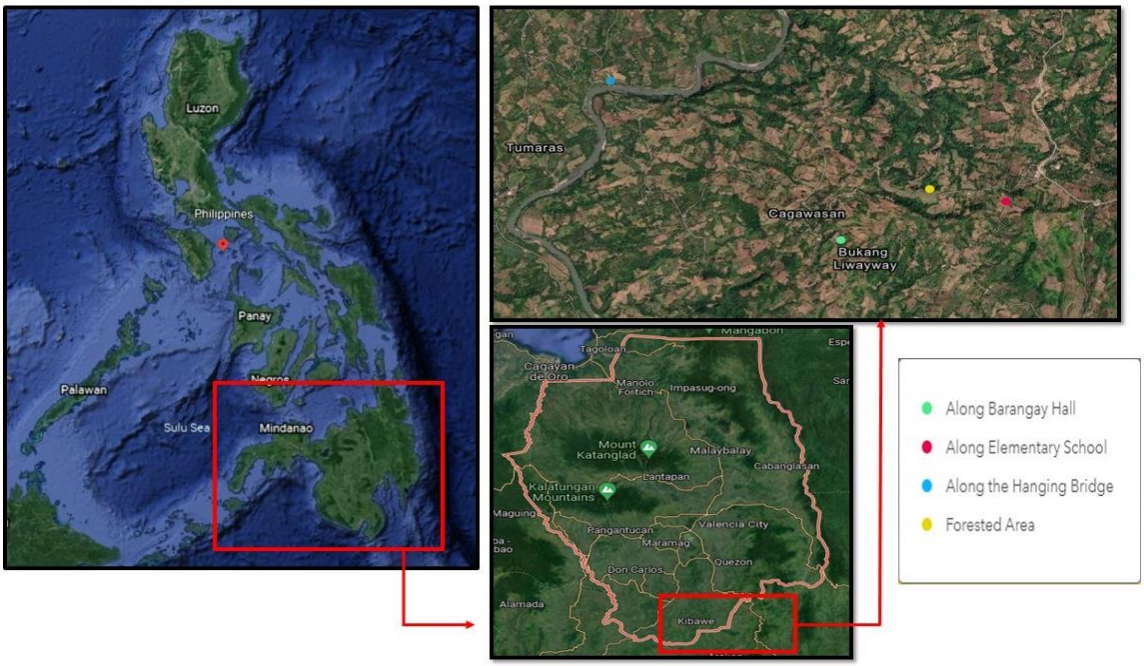

Figure 1. Map of Bukangliwayway, Kibawe, Bukidnon

Assessment of conservation status. The conservation status of the species of flora collected were assessed as critically endangered (CR), endangered (EN), and vulnerable (VU), other threatened species (OTS), other wildlife species (OWS) based on the International Union for Conservation of Nature (IUCN) Redlist of Threatened Species (2016) and Fernando et al. (2008) and DAO (2017-11), which employs specific threshold on quantitative criteria. Ecological status of the species was evaluated based on published literatures, interview and experts' knowledge. A taxon is CE when it is facing an extremely high risk of extinction in the wild, due to very small population sizes, rapid declines in population, or other factors that severely threaten its survival, and likely to become extinct in the near future. EN species still have small populations or populations that are declining rapidly, without intervention, they are at risk of extinction in the foreseeable future. VU species are those that are facing a high risk of extinction in the wild, still have significant population declines or small populations. If conservation actions are not implemented, they are likely to become endangered in the near future.

Propagation through Wildlings and Establishment of Community Economic Garden. Economic, threatened, and endemic species conserved were selected based on the degree of threats the species is facing as well as on its economic importance compared to other plant species. *Ex situ* conservation was conducted on the selected species using wildlings and seeds. This was be done in the Natural Science Research Center (NSRC) screen house. Likewise, a community economic garden was established in the locality to propagate the economic plants. The propagated wildlings and plantlets which are already established were then planted back to the study site.

RESULTS AND DISCUSSION

Documentation of Indigenous Plants

Two (2) vegetation types were surveyed in this study. Site 1 was the forested area which composed of tall trees, understory shrubs, vines and herbs, which is a forest fragment found in Bukangliwayway (Figure 2a). Site 2 was within the community along the road and majority of the area is agroecosystem (Figure 2b).

Table 1 shows the preliminary list of vascular plants found in two vegetation types of Bukangliwayway, Kibawe, Bukidnon. Results showed a total of 123 species placed in 99 genera and 58 families. There were 86 species found in site 1 and 50 species found in site 2. *Alocasia macrorrhizos* (L.) G. Don in Sweet, *Osmoxylon* sp, *Homalanthus* sp, *Litsea philippinensis* Merr. known as "Bakan", *Lygodium circinnatum* (Burm.f.) Sw. also known as "Nito", *Dysoxylum* sp, *Artocarpus blancoi* (Elmer) Merr. (Antipolo), *Artocarpus ovatus* Blanco (Pangi), *Nephrolepis biserrata* (Sw.) Schott., *Piper aduncum* L. (Buyo-buyo), *Piper* sp., *Selaginella delicatula* (Desv.) Alston. (Banggat), and *Solanum torvum* Sw. (Figure 3) were the 13 species can be found in both vegetation types. In general, these plants hold significant potential to sustain food security, as used in agriculture as source of protein, fiber, mineral, and as ornamentals.

Figure 2. Panoramic view of the forest fragment found in Matanos Mountain, Sitio Mabuhay, Purok 2 (a), and portion of agroecosystem area found in Bukangliwayliway, Kibawe, Bukidnon (b).

Table 1. Plant species found in Bukangliwayliway, Kibawe, Bukidnon with Family, Status and Endemicity

Family	Scientific Name	Site 1	Site 2	Status	Endemicity	Voucher No.
Acanthaceae	1. *Andrographis paniculata* (Burm. f.) Wall. ex Nees	*		NE	N	CMUBL028
	2. *Justicia gendarussa* Burm F.		*	NE	N	CMUBL023
Anacardiaceae	3. *Mangifera indica* L.		*	DD	N	
Apocynaceae	4. *Alstonia scholaris* (L.) R.Br.	*		LC	N	CMUBL026
	5. *Tabernaemontana pandacaqui* Poir. in Lam	*		LC	N	CMUBL006
	6. *Tabernaemontana* sp		*	NE	N	
Araceae	7. *Alocasia macrorrhizos* (L.) G.Don in Sweet	*	*	NE	N	
	8. *Homalomena philippinensis* Engl. ex Engl. & K.Krause	*		NE	N	CMUBL004

	9. *Schismatoglottis calyptrata* (Roxb.) Zoll. & Moritzi	*		NE	N	CMUBL036
	10. *Xanthosoma sagittifolium* (L.) Schott		*	NE	N	
Araliaceae	11. *Osmoxylon* sp	*	*	NE	N	CMUBL037
	12. *Polyscias* sp	*		NE	N	
Arecaceae	13. *Arenga pinnata* (Wurmb.) Merr.	*		LC	N	
	14. *Calamus* sp	*		NE	N	
	15. *Caryota rumphiana*Mart.	*		LC	N	
	16. *Caryota* sp		*	NE	N	
	17. *Saribus rotundifolius* (Lam.) Blume		*	OTS	N	
Aspleniaceae	18. *Asplenium polyodon* G.Forst.	*		NE	N	CMUBL050
Asteraceae	19. *Chromolaena odorata* (L.) R.M.King & H.Rob.		*	NE	N	
	20.*Crassocephalum* sp		*	NE	N	
	21. Erigeron sumatrensis Retz.	*		NE	N	
Athyriaceae	22. *Diplazium sibuyanense* (Copel.) Alderw.	*		OTS	E	CMUBL013
Brownlowiaceae	23. *Diplodiscus* sp	*		NE	N	CMUBL032
Burseraceae	24. *Garuga floribunda*Decne.	*		LC	N	CMUBL045
Byttneriaceae	25. *Kleinhovia hospita* L.		*	LC	N	
Cannabaceae	26. *Trema orientalis* (L.) Blume		*	LC	N	
Clusiaceae	27. *Garcinia rubra*Merr.	*		NT	E	CMUBL055
Combretaceae	28. *Terminalia catappa* L.	*		LC	N	
Cordiaceae	29. *Cordia dichotoma*G.Forst.	*		LC	N	
Costaceae	30. *Hellenia speciosa* (J.Koenig) Govaerts	*		LC	N	CMUBL033
Cunoniaceae	31. *Weinmannia* sp	*		NE	N	
Dennstaedtiaceae	32. *Microlepia*sp	*		NE	N	CMUBL052
Dioscoreaceae	33. *Dioscorea alata* L.	*		NE	N	
	34. *Dioscorea hispida*Dennst.	*		NE	N	CMUBL018
Dipterocarpaceae	35. *Shorea polysperma* (Blanco) Merr.	*		VU/LC	E	
Dombeyaceae	36. *Pterospermum diversifolium* Blume	*		LC	N	CMUBL031
Dryopteridaceae	37. *Bolbitis rhizophylla*(Kaulf.) Hennipman	*		NE	N	CMUBL041
	38. *Ctenitis*sp	*		NE	N	CMUBL040
	39. *Dryopteris* sp	*		NE	N	CMUBL039
Elaeocarpaceae	40. *Elaeocarpus* sp	*		NE	N	CMUBL027

Euphorbiaceae	41. *Acalypha amentacea*Roxb.	*		NE	N	CMUBL001
	42. *Acalypha* sp	*		NE	N	CMUBL008
	43. *Euphorbia* sp		*	NE	N	
	44. *Hevea brasiliensis*(Willd. ex A.Juss.) Müll.Arg.	*		LC	N	
	45. *Homalanthus* sp	*	*	NE	N	
	46. *Macaranga tanarius* (L.) Müll.Arg. in DC.		*	LC	N	CMUBL063
	47. *Melanolepis multiglandulosa* (Reinw. ex Blume) Rchb. & Zoll.		*	LC	N	CMUBL056
Fabaceae	48. *Erythrina variegata* L. in Stickm.	*		LC	N	CMUBL015
	49. *Leucaena leucocephala* (Lam.) de Wit	*		NE	N	
	50. Pterocarpus indicus Willd.	*		EN/VU	N	CMUBL009
Gesneriaceae	51. *Epithema ceylanicum* Gardner	*		LC	N	CMUBL046
Lamiaceae	52. Clerodendrum williamsii Elmer	*		VU	E	CMUBL016
	53. *Gmelina arborea Roxb*. ex Sm.	*		LC	N	
Lauraceae	54. *Litsea philippinensis* Merr.	*	*	NT	E	
	55. *Neolitsea* sp	*		NE	N	
	56. *Persea americana* Merr.		*	LC	N	
Lecythidaceae	57. *Barringtonia* sp	*		NE	N	
Loranthaceae	58. *Amyema* sp		*	NE	N	
Lygodiaceae	59. *Lygodium circinnatum*(Burm.f.) Sw.	*	*	NE	N	CMUBL011
Malvaceae	60. *Urena lobata*L.		*	LC	N	CMUBL059
Marantaceae	61. *Donax canniformis* (G.Forst.) K.Schum. in Engl.	*		NE	N	
Meliaceae	62. *Azadirachta indica*A.Juss.		*	LC	N	
	63. *Dysoxylum* sp	*	*	NE	N	
	64. *Melia azedarach* L.		*	LC	N	
	65. *Sandoricum koetjape* (Burm.f.) Merr.		*	LC	N	
Menispermaceae	66. *Anamirta cocculus* (L.) Wight & Arn.	*		NE	N	
	67. *Tinospora glabra* (Burm.f.) Merr.	*		NE	N	CMUBL010
Moraceae	68. *Artocarpus blancoi* (Elmer) Merr.	*	*	LC	E	

	69. Artocarpus altilis (Park.) Fosb.		*	NE	N	
	70. *Artocarpus ovatus* Blanco	*	*	NE	E	CMUBL012
	71. *Ficus ampelas* Burm.f.		*	LC	N	CMUBL065
	72. *Ficus cumingii* Miq. in Hook.	*		LC	N	CMUBL005
	73. *Ficus gigantifolia* Merr.	*		NT	E	CMUBL020
	74. *Ficus nota* (Blanco) Merr.	*		LC	N	CMUBL029
	75. Ficus septica Burm.f.		*	LC	N	CMUBL062
	76. *Ficus* sp. 1		*	NE	N	CMUBL060
	77. *Ficus* sp. 2		*	NE	N	CMUBL064
	78. *Ficus virgata* Reinw. ex Blume	*		NE	N	
	79. *Syzygium cumini* (L.)					
Myrtaceae	Skeels		*	LC	N	
	80. *Nephrolepis biserrata*					
Nephrolepidaceae	(Sw.) Schott	*	*	NE	N	CMUBL025
	81. *Nephrolepis hirsutula* (G.Forst.) C.Presl		*	NE	N	CMUBL057
Orchidaceae	82. *Bulbophyllum* sp	*		NE	N	CMUBL035
Pandaceae	83. *Pandanus* sp		*	NE	N	
	84. *Bischofia javanica*					CMUBL058
Phyllanthaceae	Blume		*	LC	N	
	85. *Peperomia pellucida*					
Piperaceae	(L.) Kunth	*		NE	N	
	86. *Piper aduncum* L.	*	*	LC	N	
	87. *Piper* sp	*	*	NE	N	CMUBL054
	88. Paspalum setaceum					CMUBL024
Poaceae	Michx.	*		NE	N	
	89. Drynaria sparsisora					
Polypodiaceae	(Desv.) T.Moore	*		NE	N	
	90. Phymatosorus membranifolius (R.Br.) S.G.Lu	*		NE	N	CMUBL053
	91. Microsorum punctatum (L.) Copel.	*		NE	N	CMUBL047
	92. *Phymatosorus scolopendria* (Burm.f.) Pic.-Serm.	*		NE	N	CMUBL003
Primulaceae	*93. Maesa* sp	*		NE	N	CMUBL017
	94. Adiantum capillus-					
Pteridaceae	*veneris* L.	*		LC	N	CMUBL048
	*95. Antrophyum*sp	*		NE	N	CMUBL049
	96. Pityrogramma calomelanos (L.) Link		*	NE	N	CMUBL021
	97. Pteris ensiformis Burm.	*		NE	N	
	98. Pteris tripartita Sw.		*	NE	N	
	99. Pteris vittata L. ex Hieron.		*	LC	N	
Rubiaceae	*100. Coffea arabica* L.		*	EN	N	

	101. Coffea excelsa A. Chev.	*		NE	N	
	102. Morinda citrifolia L.		*	NE	N	
	103. Nauclea sp		*	NE	N	
Sapindaceae	*104. Mischocarpus* sp.	*		NE	N	CMUBL019
Selaginellaceae	*105.Selaginella delicatula* (Desv.) Alston	*	*	NE	N	CMUBL043
	106. Selaginella remotifolia Spring	*		NE	N	CMUBL051
Smilacaceae	*107.Smilax* sp	*		NE	N	
Solanaceae	*108.Capsicum frutescens* L.	*		LC	N	
	109. Solanum torvum Sw.	*	*	NE	N	CMUBL014
Tectariaceae	*110. Tectaria polymorpha* (Wall. ex Hook.) Copel.	*		NE	N	CMUBL022
Thelypteridaceae	*111. Christella* sp	*		NE	N	CMUBL038
	112. Macrothelypteris sp	*		NE	N	
	113. Macrothelypteris torresiana (Gaudich.) Ching		*	NE	N	
	114. Pneumatopteris laevis (Mett.) Holttum	*		NE	E	CMUBL030
	115. Pneumatopteris nitidula (C.Presl) Holttum	*		NE	E	CMUBL034
Urticaceae	*116. Oreocnides*p	*		NE	N	CMUBL044
Verbenaceae	*117. Lantana camara* L.		*	NE	N	
	118. Vitex parviflora A. Juss.		*	LC	E	CMUBL061
Vitaceae	*119. Leea aculeata* Blume ex Spreng.	*		NE	N	
	120. Leea manillensis Walp.	*		NE	N	CMUBL007
Zingiberaceae	*121. Alpinia elegans* (C.Presl) K.Schum. in Engl.	*		VU	E	
	122. Etlingera philippinensis (Ridl.) R.M.Sm.	*		NE	E	CMUBL042
	123. Globba campsophylla K.Schum. in Engl.	*		LC	E	CMUBL002

Legend: (NE = Not Evaluated, DD = Data Deficient, LC = Least Concern, NT = Near Threatened, OTS=Other Threatened, VU = Vulnerable, EN = Endangered, CR = Critically Endangered) and endemicity based on Co's digital flora (E = Endemic and N = Not Endemic).

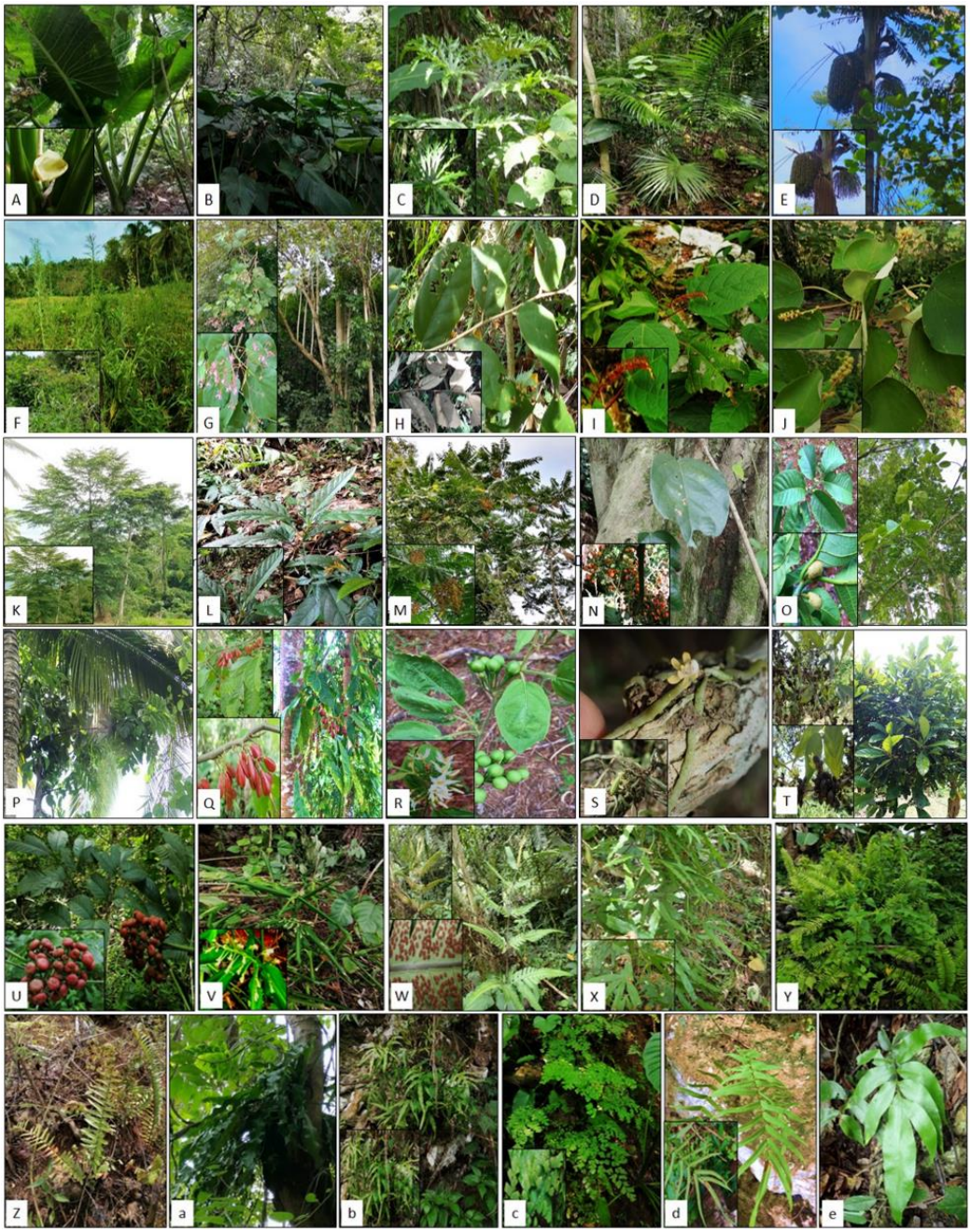

Figure 3. The vascular plants found in Bukangliwayway, Kibawe, Bukidnon. Family Araceae (A) *Alocasia macrorrhizos* (B) *Schismatoglottis calyptrate.* Family Araliaceae (C) *Osmoxylon* sp. Family Arecaceae (D) *Calamus* sp (E) *Caryota rumphiana*. Family Asteraceae (F) *Erigeron sumatrensis.* Family Byttneriaceae (G) *Kleinhovia hospital.* Family Dombeyaceae (H) *Pterospermum diversifolium*. Family Euphorbiaceae (A) *Acalypha amentacea* (B) *Melanolepis multiglandulosa*. Family Fabaceae (C) *Pterocarpus indicus*. Family Lamiaceae (D) *Clerodendrum williamsii*. Family Meliaceae (E) *Dysoxylum gaudichaudianum*. Family Menispermaceae (F) *Tinospora glabra*. Family Moraceae (G) *Artocarpus ovatus* (H) *Artocarpus blancoi*. Family Sapindaceae (A) *Mischocarpus* sp. Family Solanaceae (B) *Solanum torvum*. Family Orchidaceae (C) *Bulbophylum* sp. Family Rubiaceae (D) *Coffea excelsa*. Family Vitaceae (E) *Leea manillensis*. Family Zingiberaceae (F) *Globba campsophylla.* Family Dryopteridaceae (A) *Ctenitis* sp. Family Lygodiaceae (B) *Lygodium circinnatum*. Family Nephrolepidaceae (C) *Nephrolepis biserrata* (D) *Nephrolepis hirsutula*. Family Polypodiaceae (E) *Microsorum punctatum* (F) *Microsorum membranifolium*. Family Pteridaceae (G) *Adiantum capillus-veneris* (H) *Pteris vittata*. Family Tectariaceae (I) *Tectaria polymorpha*.

Each species' conservation status was documented. This was done in order to established a foundation for their conservation, protection, and monitoring. The preliminary list of threatened species found in Bukangliwayway, Kibawe, Bukidnon was based on the IUCN Redlist (2016) Fernando et al. (2008) and DAO (2017-11). *Coffea arabica* L. and *Pterocarpus indicus* Willd. was categorized as Endangered Species (EN), *Alpinia elegans* (C.Presl) K.Schum. in Engl., *Clerodendrum williamsii* Elmer, and *Shorea polysperma* (Blanco) Merr. are categorized as Vulnerable (VU), *Diplazium sibuyanense* (Copel.) Alderw., and *Saribus rotundifolius* (Lam.) Blume are categorized as Other Threatened Species (OTS), *Ficus gigantifolia* Merr., *Garcinia rubra* Merr. and *Litsea philippinensis* Merr. are Near Threatened Species (NT) (Table 2). A total of 10 threatened species which is 1.02% of 984 total threatened vascular plants in the Philippines (Co's Digital Flora of the Philippines: Pelser et al., 2018) were observed in the present

study. *Shorea polysperma* (Blanco) Merr. commonly known as "Tanguile" was categorized as Vulnerable (VU) species by DENR DAO (2017-11) and it was Least Concern (LC) species in IUCN (2016). *Pterocarpus indicus* Willd. commonly known as "Narra" was also categorized as VU species in DENR DAO but considered as Endangered Species in IUCN.

In this study, a total of 14 (0.30%) were identified out of 4,745 of endemic species that can be found in the Philippines. Some of the threatened species that are restricted in the country are *Diplazium sibuyanense, Garcinia rubra, Shorea polysperma* (Blanco) Merr. (Tanguile), *Clerodendrum williamsii, Litsea philippinensis* (Bakan), *Artocarpus blancoi* (Antipolo), *Ficus gigantifolia* (Opa), *Vitex parviflora* (Togas), *Alpinia elegans* (Tagbak) and *Globba campsophylla* were also endemic to the Philippines. On the other hand, other endemic but not threatened species were *Artocarpus ovatus (Pangi), Pneumatopteris laevis, Pneumatopteris nitidula and Etlingera philippinensis* (Pelser et al., 2021).

Table 2. List of threatened species and endemic species found Bukangliwayliway, Kibawe, Bukidnon

Scientific Name	**Status**
Coffea arabica L.	Endangered
Pterocarpus indicus Willd.	Endangered/Vulnerable
Alpinia elegans (C.Presl) K.Schum. in Engl.	Vulnerable, Endemic
Clerodendrum williamsii Elmer	Vulnerable, Endemic
Shorea polysperma (Blanco) Merr.	Vulnerable/Least Concern, Endemic
Diplazium sibuyanense (Copel.) Alderw.	Other Threatened Species, Endemic
Saribus rotundifolius (Lam.) Blume	Other Threatened Species
Ficus gigantifolia Merr.	Near Threatened Species, Endemic
Garcinia rubra Merr.	Near Threatened Species, Endemic
Litsea philippinensis Merr.	Near Threatened Species, Endemic

Figure 4 shows highest number of species observed is Moraceae with 11 species, followed by Euphorbiaceae with 7 species, Pteridaceae with 6 species, and Arecaceae and Thelypteridaceae with 5 species, respectively. This observation might be possible because the area has a well-draining soil that is rich in organic matter, and this type of plants can withstand wind and dry conditions well.

The epiphytic, terrestrial, and petrophytic/lithophytic habitats of the plants were also noted. Of the one hundred twenty-three (123) species documented, there were 52 tree species found under 28 families and 43 genera, 22 species of shrubs placed in 16 families and 20 genera, 32 species of herbs under 17 families and 31 genera. There are 8 species of vines, 3 epiphytes and 6 were lithophytes (Table 3). According to Pelser et al (2018) there were 9,995 species of vascular plants in the Philippines. The present revealed that the plants found in Bukangliwayway represents 1.23% of the plants found in the Philippines.

The result showed four (4) Vulnerable (VU) species, namely *Shorea polysperma, Pterocarpus indicus, Clerodendrum williamsii* and *Alpinia elegans*, two (2) Other Threatened (OT) species the *Diplazium sibuyanense* and *Saribus rotundifolius (Lam.) Blume*, and thirty-five (35) Least Concern (LC) (Table 4). According in DAO (2017-11), the Other Threatened (OT) species refers to the category is not a Critically Endangered, Endangered or even Vulnerable, but it is considered as under threat to move to the Vulnerable. The presence of endangered, vulnerable, and threatened important plants in the area dictates the need for immediate action to conserve and protect particularly the endemics, since they have higher probabilities of extinction because of their restricted habitat than widespread species. In DAO (2017-11) category there were a total of five (5) threatened species which make 0.51% of 984 total threatened vascular plants in the Philippines (Co's Digital Flora of the Philippines: Pelser et al., 2018).

Propagation of Selected Indigenous Economic Plants of Bukangliwayway, Kibawe, Bukidnon

Recognizing the growth characteristics of species is crucial for developing effective conservation policies and implementing practical conservation actions to safeguard biodiversity and prevent extinctions. There were 4 species of economically important species propagated in this study. These species are potential ornamental plants with medicinal claims and edible. The species which were propagated were *Adiantum capillus-veneris* L. *Artocarpus ovatus* Blanco, *Lygodium circinnatum*(Burm.f.) Sw., and *Mischocarpus* sp. (Figure 5).

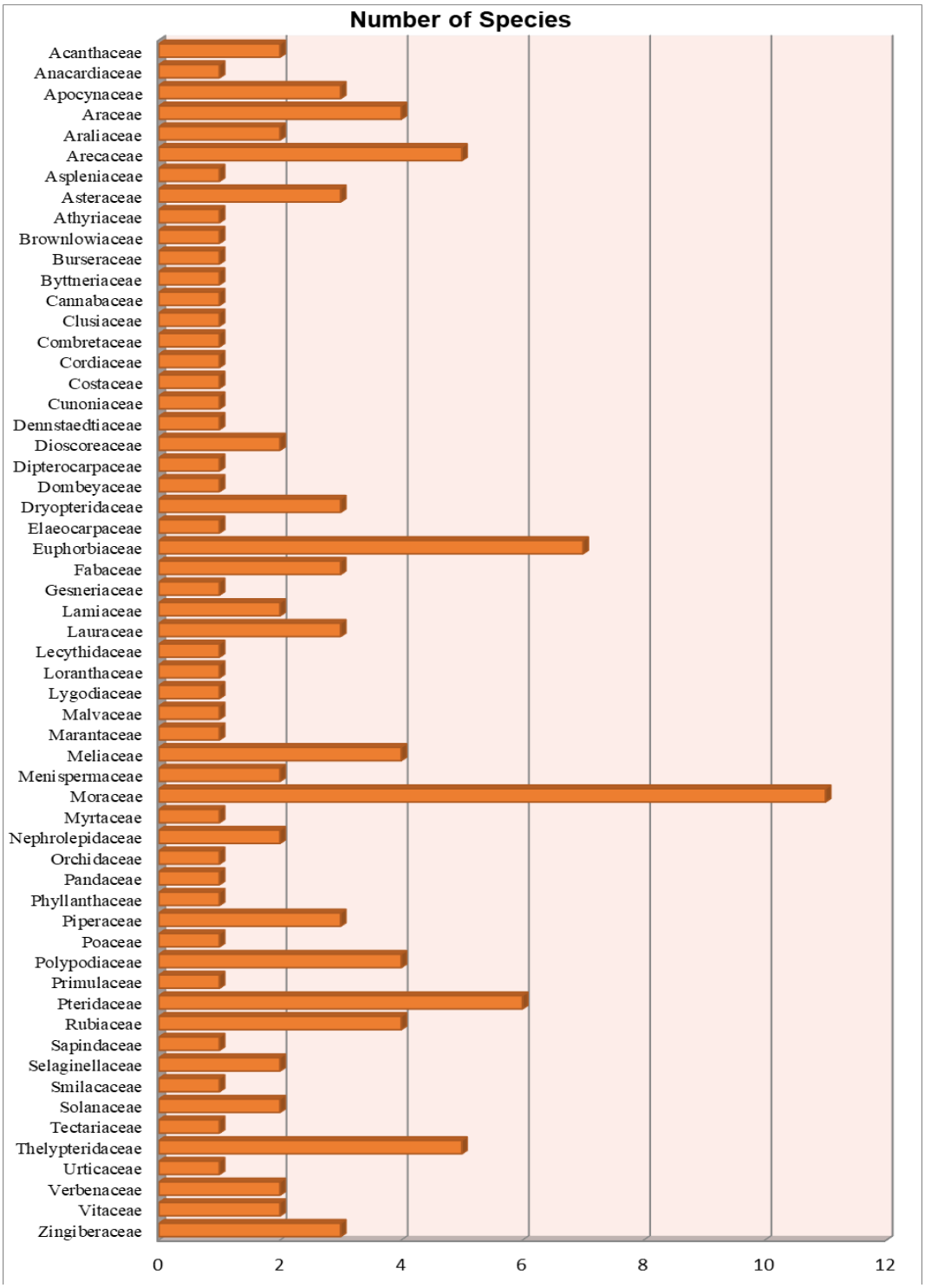

Figure 4. Number of species per family found in Brgy. Bukangliwayway, Kibawe, Bukidnon

Table 3. Classification of plant species based on growth habit found in Brgy. Bukangliwayway, Kibawe, Bukidnon

Plant Groups	**Total Number of**		
	Families	*Genus*	*Species*
Tree	28	43	52
Shrubs	16	20	22
Herbs	17	31	32
Vines	6	7	8
Epiphytes	3	3	3
Lithophytes	4	5	6
		Total	**123**

Table 4. Summary of Threatened and Least Concern plant species in Bukangliwayway, Kibawe, Bukidnon (DAO 2017-11).

Categories	Number of Species
Critically Endangered (CR)	0
Endangered (EN)	2
Vulnerable (VU)	4
Other Threatened (OT)	2
Near Threatened (NT)	3
Least Concern (LC)	35
Data Deficient (DD)	0
Total (CR, EN, VU, OT, NT)	9

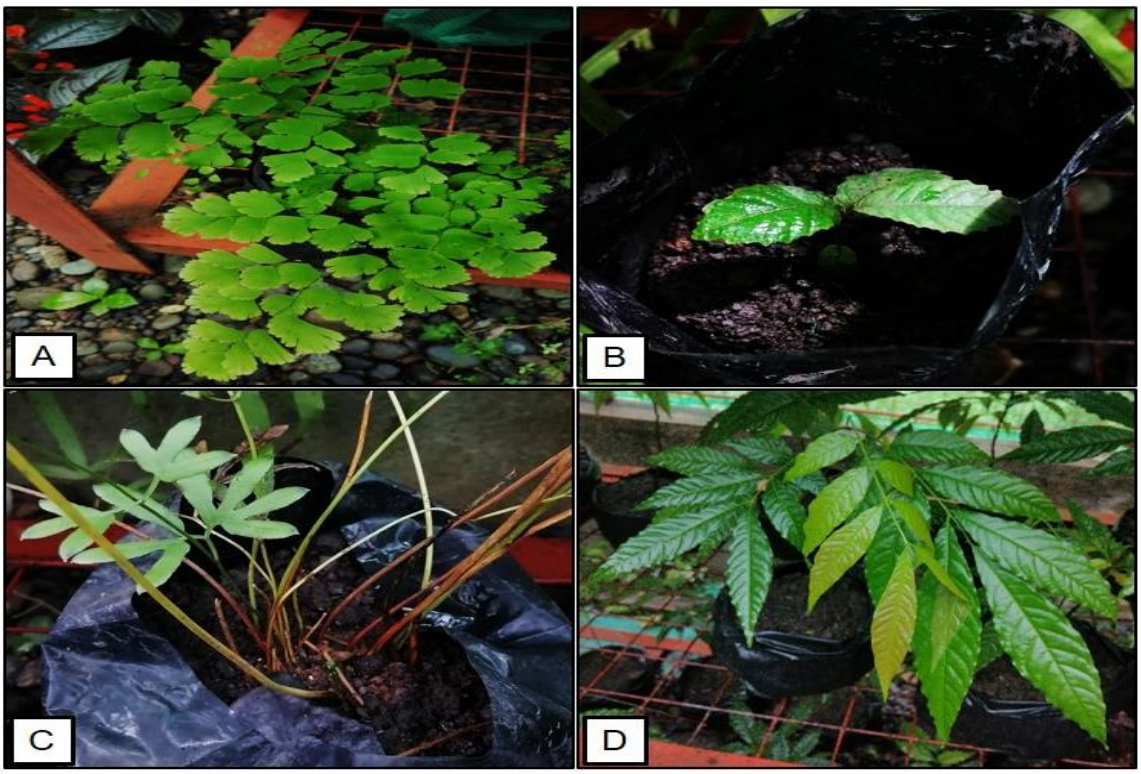

Figure 5. The propagated plant species (A) *Adiantum capillus-veneris* L. (B) *Artocarpus ovatus* Blanco (C) *Lygodium circinnatum*(Burm.f.) Sw. and (D) *Mischocarpus* sp.

Adiantum capillus-veneris **L.**

The mean of the plant height of *Adiantum capillus-veneris* L. exhibits highest growth increment of the plant in week 10 to week 11 (Figure 6). In the 5th week, the plant exhibits highest mean of the number of leaves but drop out in week 6 then goes up in week 10 and continue to goes up until week 18. The number of survivals of *A. capillus-veneris* decreases until week 18. *A. capillus-veneris* L. are epilithic or terrestrial, commonly found on moist banks of perennial streams and wet cliffs in light or deep shade (Environment Canada, 2012). Assessing the growth characteristics of *A. capillus-veneris* can help determine its conservation priority, since it has slow growth rates or limited reproductive capacity, it may be more vulnerable to extinction.

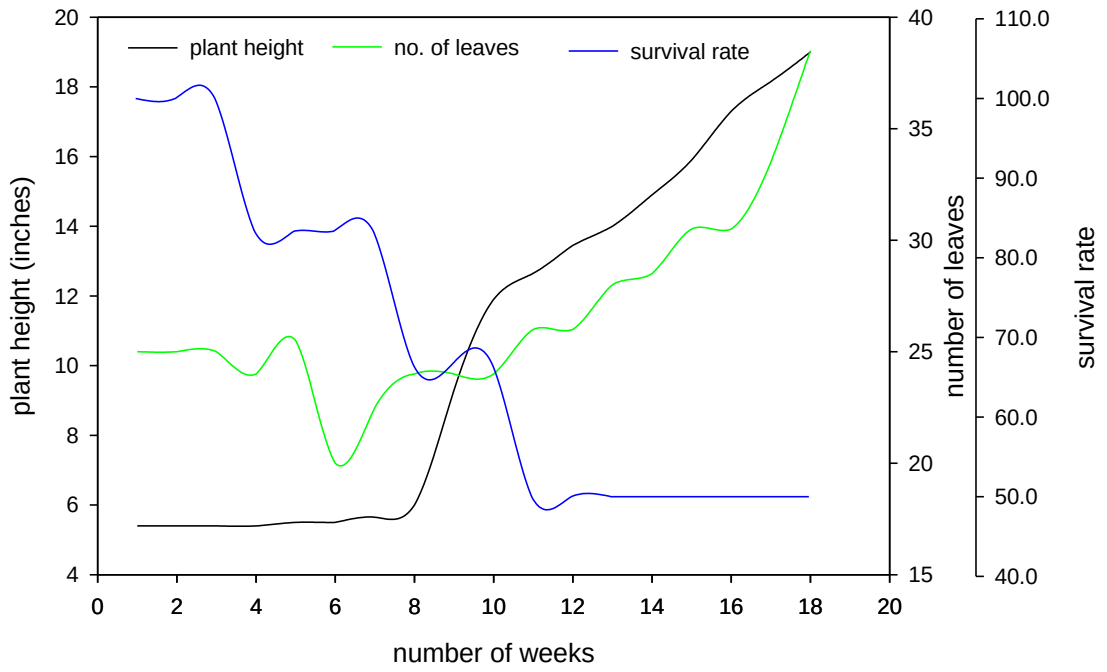

Figure 6. Growth performance of *Adiantum capillus-veneris* **L.**

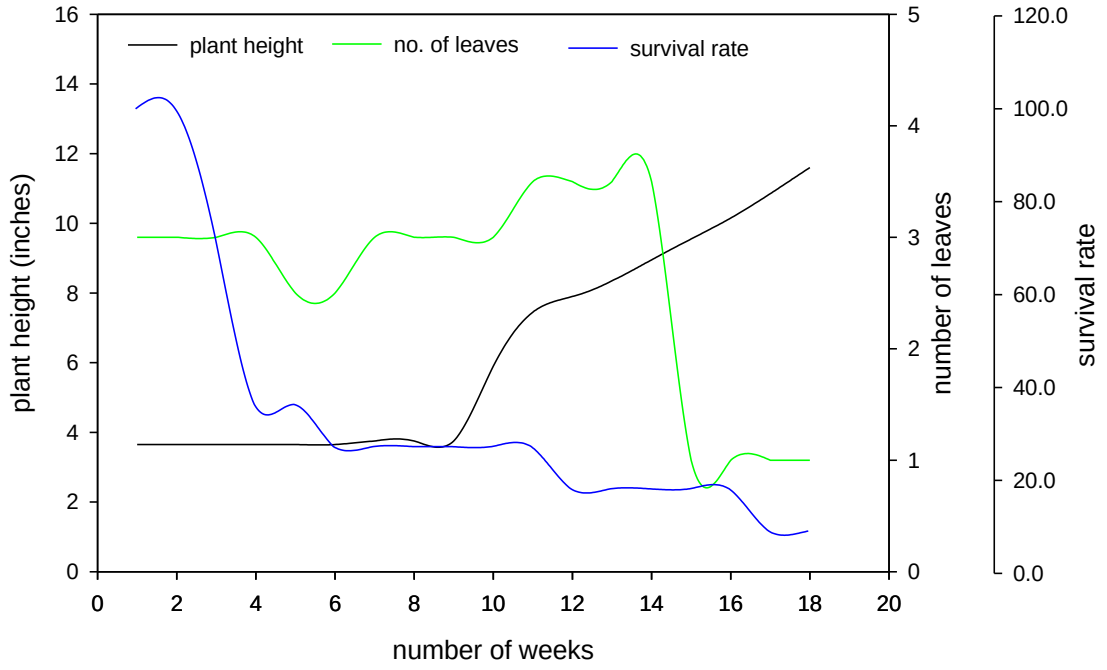

Figure 7. Growth performance of *Artocarpus ovatus Blanco*

The fronds of *A. capillus-veneris* L used for treatment of urinary tract infection. The alcoholic leaf extract was studied *in vitro* resulted that it has an antibacterial, antioxidant and inflammatory activities (Ahmed et al., 2012). The aqueous and methanol extracts of *A. capillus-veneris* has a presence of flavonoids and tannins which may responsible for antidiabetic effect (Dehdari and Hajimehdipoor, 2018). Pharmacology studies showed that this plant is used for treatment for alopecia, nephrolithiasis, scrofula and empyena (Olimat, 2020). The fronds of *A. capillus-veneris* L. was used in traditional applications as single medicine. It was reported that it can be useful for cleansing respiratory system, dyspnea, asthma, coryza and chest pain (Dehdari and Hajimehdipoor, 2018). In the Philippines the fronds of *A. capillus- veneris* L. are also used

for treatment of chest disease, cough and cold. It can also be chewed for treatment of mouth blister.

The extract of fronds with honey can be used as eye ointment. Cough, respiratory difficulties, fevers, and stomach colic can all be treated with rhizome decoctions as tea (Stuart, 2019).

Artocarpus ovatus **Blanco**

Assessing the growth characteristics of *Artocarpus ovatus* Blanco can help determine its conservation since has various economic uses that contribute to food security, traditional medicine, livelihoods and cultural practices. The wildings of *A. ovatus* exhibit the highest growth of plant

The seeds of *A. ovatus* are cooked and roasted are eaten (Ragasa, et al., 2015). Secondary metabolites such as flavonoids and polyphenols are found *Artocarpus ovatus* Blanco ethanolic leaf extract and DCM semi-crude leaf extract (Querequincia et al., 2021). The ethanolic leaf extracts were found to have significant cholesterol-lowering efficacy, as well as the ability to maintain adequate levels of catalase enzymes and suppress lipid peroxidation (Ragasa et al., 2015). *A. ovatus* Blanco yields strong, long-lasting wood that is utilized in building. The latex from the tree has the potential to be used as a chewing gum foundation known as "anubing gum" (Fern, 2021).

Lygodium circinnatum **(Burm.f.) Sw.**

While *Lygodium circinnatum* does not have significant direct economic uses, it may have some limited applications in horticulture, erosion control, habitat restoration, and research, its potential as invasive species underscore the importance of carefully managing its presence in various ecosystems. A combination of garden soil and vermicast soil was also used as a media to the plant. Figure 8 shows that week 7 exhibits a highest growth in *L. circinnatum* and the growth continue until week 18. The mean of number of leaves decreases in week 5 to 6 but it increases from week 7 until week 18 (Fig. 14). The number of survivals in *L. circinnatum* decreases in week 5 and remains the same until week 18 (Fig. 15). Grows in a light shaded area. It can be found in a low to medium altitudes (Stuart G. , 2019).

The methanolic leaf extract of *Lygodium circinnatum* (Burm.f.) Sw. has an antioxidant activity (Lai and Lim, 2011). Aqueous extract of the plant has a presence of

until week 16 but it decreases in week 17 (Figure 7). The mean of the number of leaves decreases in week 5 but increases in week 7 and continue to decrease until week 18. In this study, the wildings were covered with transparent cellophane from week 1 until week 4. In week 4, the survival number of the wildings of *A. ovatus* has a highest number of dead plants. Out of 11 wildings of *A. ovatus* planted the survival number decreases and only 1 wilding survive until week 18. *A. ovatus* Blanco can be found up to 750 meters above sea level, lowland forest and shrubby vegetations exist. At 15% moisture content, the density of the wood is 550-970 kg/m3 (Sosef, 2021).

phenolics and flavonoids that were abundant in the plant (Saman et al., 2017). Young leaves are cooked and eaten as a vegetable (Fern, 2021). *Lygodium circinnatum* (Burm.f.) Sw. was used as a treatment for wounds and for protective medicine after childbirth (Delos Angeles and Buot, 2012). Stipes is used to neutralize the poison by chewing and applying it to the bites of venomous reptiles and insects (Stuart, 2019). *L. circinnatum* was also use in making hats and basket wares (Fern, 2021).

Mischocarpus sp.

Some species within the *Mischocarpus* genus produce edible fruits that are consumed by local communities. The fruits may be eaten fresh, processed into jams or preserves, or used as flavorings in culinary dishes. Extracts from these plant parts may be used to treat ailments such as fevers, gastrointestinal issues, or skin conditions. The mean of plant height of *Mischocarpus* sp. from week 1 to week 18, starts to exhibit in week 5 (Figure 9). Week 11 shows the highest growth. Vermicomposts can have consistently positive effects on plant germination growth and yields. The vermicomposts, especially those from animal waste sources, usually contained more mineral elements than commercial plant growth media, and many of these elements were changed to forms more that could be readily taken up by the plants, such as nitrates, exchangeable phosphorus, and soluble potassium, calcium, and magnesium (Arancon and Edwards, 2005). The mean of the number of leaves starts to increase from week 4 until week 18. The survival number of *Mischocarpus sp*. starts to decrease on week 2, week 3 to week 6 it has the same number of wildings that survive and continue to decrease up to week 18.

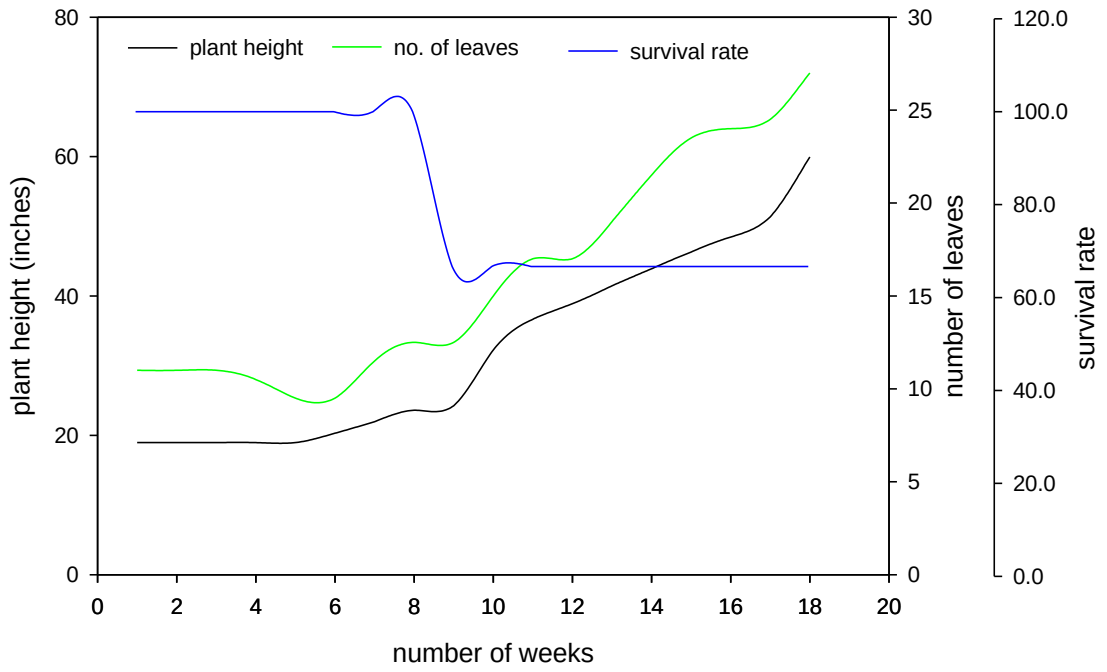

Figure 8. Growth performance of *Lygodium circinnatum* **(Burm.f.) Sw.**

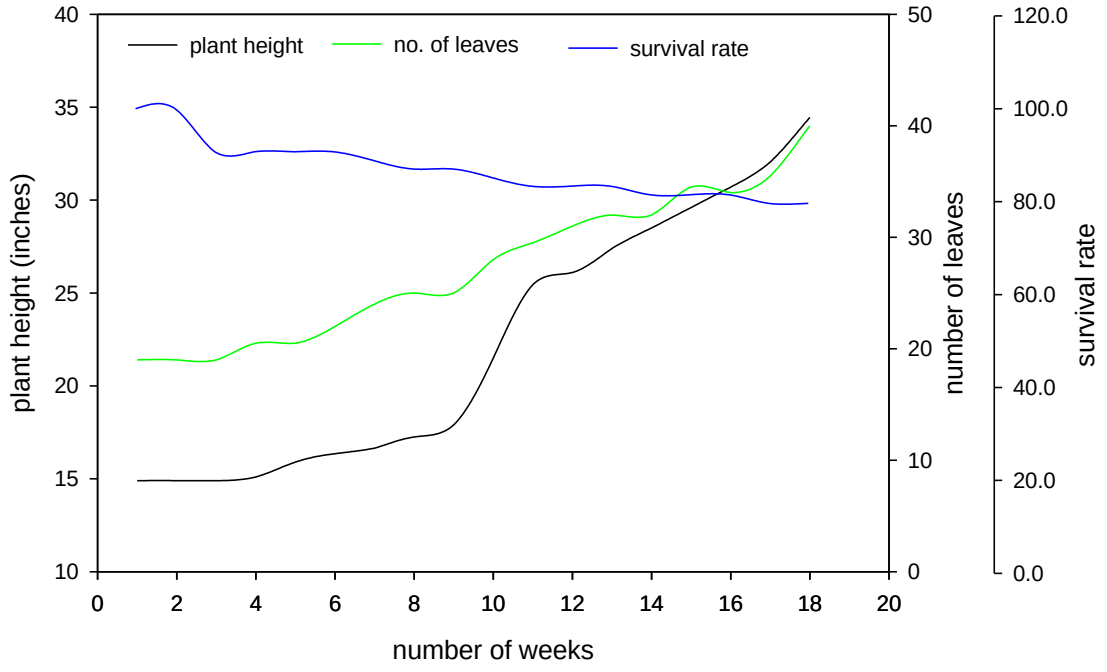

Figure 9. Growth performance of *Mischocarpus sp*.

CONCLUSION

This study provided a preliminary survey/list with highlighting on the conservation status of the plants found in Brgy. Bukangliwayway, Kibawe, Bukidnon. The study concludes the following: 123 species under 112 genera and 58 families were listed. There were two (2) Endangered (EN), four (4) Vulnerable (V), two (2) Other Threatened (OTS), three (3) Near Threatened (NT) and thirty-five (35) Less Concerned (LC) plant species while fourteen (14) endemic species were documented plant species. Several disturbances were observed in the area which place some plants in the threatened category such conversion of forest areas into agricultural lands. The remaining and diminishing forest areas of Bukangliwayway reveals the presence of

indigenous and endemic species which imply a significant aspect of our Philippine flora which therefore must be conserved. Propagation trials also reveal that *ex situ* conservation is possible to increase the population of the plant species which may be used for commodification of the community and likewise for the reintroduction of the species to the natural habitat to regain forest cover. Empowering the communities to participate actively in decision-making processes, value chain development, and collective enterprises must be considered to strengthen their economic resilience and cultural identity.

Author Contributions: MGM, FMA, and FPC: conception and design of study. MMMG, HPL, VRA, CRML, MTM, RAL, and CJOL: acquisition of data, writing—provided deeply discussion and sorted out the references. MGM, FPC, and FMA: writing—review and editing. All authors have read and agreed to the published version of the manuscript.

Funding: This study was mainly supported by the grant from Central Mindanao University CMU-Funded Research (R-0267).

Data Availability Statement: The authors confirm that the data supporting the findings of the study are available within the article. Raw data that support the findings of this study are available from the corresponding author, upon reasonable request.

Acknowledgments: The authors gratefully acknowledge the Department of Environment and Natural Resources or DENR Region X Office for the issuance of the Gratuitous Permit R10-2021-09; the logistic and implementing agency Central Mindanao University (CMU), Center for Biodiversity Research and Extension in Mindanao (CEBREM), and the Natural Science Research Center (NSRC). We would also like to express our gratitude to Hon. Gomercindo Patalita for his unwavering support support and cooperation throughout the duration of this research.

Conflict of Interest: The authors have no competing interests to declare that are relevant to the content of this article.

LITERATURE CITED

Ahmed, A., Jahan, N., Wadud,A., Imam, H., Hajera, S., & Bilal, A. (2012). Physicochemical and Biological Properties of *Adiantum capillus-veneris* Linn: An important drug of Unani System of Medicine. *Int. J. Cur. Res. Rev.*, Vol 04 (21).

Amit, S., Sunil, K., Bhatt, S.P., Arvind, N. (2011). Antibacterial activity of *Diplazium esculentum* (Retz.) Sw,. *Pharmacognosy Journal*, 3(21) 77-79.

Amoroso, V.B., Coritico, F., Fritsch P. (2016). Species Richness and Conservation Status of Ferns and Lycophytes in Mt. Hamiguitan Range Wildlife Sanctuary, Davao Oriental, Philippines. *Philippine Journal of Science*. 142(2):127- 137. https://www.researchgate.net/publication/308880975_Species_Richness_and_Conservation_Status_of_Ferns_and_Lycophytes_in_Mt_Hamiguitan_Range_Wildlife_Sanctuary_Davao_Oriental_Philippines.

Amoroso, V.B., Laraga, S.H. & Calzada, B.V. (2011). Diversity and assessment of plants in Mt. Kitanglad Range Natural Park. Gardens' Bulletin Singapore. 63(1 & 2): 219–236.

Arancon, N. Q. & Edwards, C.A. (2005). Effects of Vermicomposts on Plant Growth. Soil Ecology Laboratory, The Ohio State University, Columbus, OH 43210 USA.

Arquion, R. D., Galanida, C. C., Villamor, B., & Aguilar, H. T. (2015). Ethnobotanical study of indigenous plants used by local people of Agusan del Sur, Philippines. *Asia Pacific Higher Education Research Journal (APHERJ)*, *2*(2).

Benjamin, A. & Manickam V.S. (2007). Medicinal pteridophytes from the Western Ghats. *Indian Journal of Traditional Knowledge*, 6(4): 611-618.

Carcia, F., Pivel, J.P., Guerrero, A., Brieva, A., Martinez-Alvazar, M.P., Caamano-Somoza, M. and Conzlez, S. (2006): Phenolic components and anti-oxidant activity of Fernblock, an aqueous extract of the aerial parts of the fern *Polypodium leucotomos*. *Methods Find Exp. Clin. Pharmacol*. 28: 157-160.

Chai T.T., Kwek M.T., Ong H.C., Wong F.C. (2015). Water fraction of edible medicinal fern *Stenochlaena palustris* is a potent α-glucosidase inhibitor with concurrent antioxidant activity. *Food Chem*, 186:26–31.

Chai T.T., Mohan M., Ong H.C., Wong F.C. (2014). Antioxidant, iron-chelating and anti-glucosidase activities of *Typha domingensis* Pers (Typhaceae). *Trop J Pharm Res,* 13(1):67–72.

Chai T.T., Quah Y., Ooh K.F., et al. (2013). Anti-proliferative, antioxidant and iron-chelating properties of the tropical highland fern, *Phymatopteris triloba* (Houtt) Pichi Serm (Family Polypodiaceae) *Trop J Pharma Res.*12:747–753.

Chai, T.T., Panirchellvum E., Ong, H.C., and, Wong F.C. (2012). Phenolic contents and antioxidant

properties of *Stenochlaena palustris*, an edible medicinal fern. *Bot Stud*, 53:439–446.

Chen YH, Chang FR, Lin YJ, et al. Identification of phenolic antioxidants from Sword Brake fern (*Pteris ensiformis* Burm.) *Food Chem*. 2007; 105:48–56.

Choudhry S.Z., Bhatia N., Ceilley R., et al. (2014). Role of oral *Polypodium leucotomos* extract in dermatologic diseases: a review of the literature. *J Drugs Dermatol*. 13: 148–153.

Copeland, E. B. (1942). Edible ferns. *American Fern Journal*, 32: 121–126.

de Winter WP, Amoroso VB (2003) Plant Resources of South-East Asia No 15(2). Cryptograms: Ferns and fern allies. Backhuys Publishers, Leiden, The Netherlands. 268 pp. DENR Administrative Order No. 2017-11, 2017. Accessed 1 December 2018. http://server2.denr.gov.ph/uploads/rmdd/dao-2017-11.pdf.

Dehdari, S & Hajimehdipoor, H. (2018). Medicinal Properties of *Adiantum capillus-veneris* Linn. in Traditional Medicine and Modern Phytotherapy: A Review Article. *Iran J Public Health*, pp.188-197.

Delos Angeles, M. & Buot, I. . (2012). Orders and Families of Philippine Pteridophytes. *Journal of Nature Studies*, 11 (1&2): 19-33.

DENR Administrative Order, 2017. Updated National List of Threatened Philippine. Plants and Their Categories. DAO2017-11.https://server2.denr.gov.ph/uploads/rmdd/dao-2017-11.pdf

Ding Z.T., Fang Y.S., Tai Z.G., Yang M.H., Xu Y.Q., Li F., Cao Q, E. (2008). Phenolic content and radical scavenging capacity of 31 species of ferns. *Fitoterapia*. 79(7-8):581-3.

Fern, K. (2021, September 25). Retrieved from Tropical Plants Database: http://tropical.theferns.info/viewtropical.php?id=Artocarpus+ovatus

Fern, K. (2021, September 26). Retrieved from Tropical Plants Database: http://tropical.theferns.info/viewtropical.php?id=Lygodium+circinnatum

Fernando, E.S., Co, L.C., Lagunzad, D.A., Gruezo, W.Sm., Bacelona, J. F., Madulid, D, A., Lapis, A. B., Texon, G. I., Manila, A.C., & Zamora, P, M. (2008). Threatened plants of the Philippines: A preliminary assessment. *Asia Life Sciences*, 3: 1-52.

Fernando, W.G. (2012). Plants: An International Scientific Open Access Journal to Publish All Facets of Plants, Their Functions and Interactions with the Environment and Other Living Organisms. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4844262/

Gediya, S.K., Mistry, R.B., Patel, U.K., Blessy, M., Jain, H.N. (2011). Herbal plants: used as cosmetics. *Journal of Natural Products and Plant Resources*, 1: 24-32.

IUCN, 2021. The nternational Union for Conservation of Nature Red List of Threatened Species. Version 2021-1. http://www.iucnredlist.org

Jin, H.M., Kang, S.J., and Lee, S.H. (2005): Cosmetic composition for scrubbing. PCT Int. Appl., WO/2005/082328,. 1020050016923.

Kim, H. J., Lim, H.W., Choi, S.W. and Yoon, C.S. (2006): Antimicrobial effect of ethanol extract of *Dryopteris crassirhizoma* Nakai on Propionibacterium acnes. *J. Soc. Cosmet. Sci. Korea*, 32:201–208.

Lafont R, and Dinan L. 2003. Practical uses for ecdysteroids in mammals and humans: an update. *J Insect Sci* **3**.7, 30 pp. http://www.insectscience.org/3.7/

Lai, H. & Lim, Y. (2011). Antioxidant Properties of Some Malaysian Ferns. *International Conference on Chemical, Biological and Environmental Engineering*, vol.20.

Olimat, S. (2020). Current Application of *Adiantum capillus-veneris* L. based in Uses mentioned by Ibn Rushd - A Review. *Annals of Arthritis and Clinical Rheumatology*, 3(1): 1019.

Pelser P.B., Barcelona J.F. & Nickrent D.L. (Eds.), 2018. Co's Digital Flora of the Philippines. http://www. philippineplants.org

Pelser P.B., Barcelona J.F. & Nickrent D.L. (Eds.), 2021. Co's Digital Flora of the Philippines. http://www. philippineplants.org

Philatlas (2015). Bukangliwayway, Kibawe, Bukidnon.https://www.philatlas.com/Mindanao/r10/bukidnon/kibawe/bukang-liwayway.html

Praptosuwiryo, T. (2016, October 22). *Ferns and allies (PROSEA)*. Retrieved from Plant Use: https://uses.plantnet-project.org/en/Lygodium_(PROSEA)

Querequincia, J.M.B., Osi, M.O., & Sy, S.C. (2021). Phytochemical Analysis And Assessment Of The

Free Radical Scavering Activities of the Extracts of *Artocarpus ovatus* Blanco (Moraceae) Leaves. *International Journal of Scientific & Technology Research Vol 10* , ISSN 2277-8616.

Querequincia, J.M.B., Osi, M.O., & Sy, S.C. . (2015). Cholesterol-lowering activity of *Artocarpus ovatus* Blanco (Moraceae) ethanolic leaf extract in animal models . *Journal of Chemical and Pharmaceutical Research*, 7(3):861-864.

Ragasa, C.Y., Caro, J.L, & Shen, C. (2015). Chemical constituents of *Artocarpus ovatus* Blanco. *Der Pharma Chemica*, 7 (2):178-182 .

Saman, R.B.A, Mokhtar, R.A., & Iqbal, M. (2017). Identification of Bioactive Compounds, Quantitative Measurement of Phenolics and Flavonoids Content, and Radical Scavenging Activity of *Lygodium circinnatum*. *Transactions on Science and Technology*, Vol. 4, No. 3-3, 354 - 359.

Shin S.L., Lee C.H. (2010). Antioxidant effects of the methanol extracts obtained from aerial part and rhizomes of ferns native to Korea. *Korean J Plant Res.* 23(1):38–46.

Shin, S.L. (2010). Functional components and biological activities of Pteridophytes as healthy biomaterials. Chungbuk National University, Cheongju, Korea, Ph.D. dissertation.

Singh M., Singh N., Khare P., et al. (2008). Antimicrobial activity of some important *Adiantum* species used traditionally in indigenous systems of medicine. *J Ethnopharmacol.* 115:327–329.

Sosef, M. (2021, September 25). *Artocarpus ovatus (PROSEA)*. Retrieved from Plant Use: https://uses.plantnet-project.org/en/Artocarpus_ovatus_(PROSEA)#:~:text=A%20medium%2Dsized%20tree%20up,secondary%20veins%2C%20stipules%20not%20amplexicaul.

Stuart, G. (2019, December). *Plagiarism of the Compilation on Philippine Medicinal Plants Under the Guise of Fair Use*. Retrieved from Philippine Medicine Plant: http://www.stuartxchange.org/Alambrillo

Stuart, G. (2019, March). Retrieved from Philippine Medical Plants: http://www.stuartxchange.org/Nito

Suba, M., Arriola, A.H., & Alejandro, G. J (2019). A preliminary checklist of vascular plants of Mt. Arayat National Park, Pampanga, Philippines. Biodiversity Journal, 2019, 10 (1): 3746.https://doi.org/10.3196/Biodiv.Jour.2019.10.1.37.46

Thakur, R. C., Hosoi, Y. & Ishii, K. (1998). Rapid i*n vitro* propagation of *Matteuccia struthiopteris* (L.) Todaro –an edible fern. *Plant Cell Rep*. 18: 203–208.

Uprety Y, Asselin H, Boon EK, et al. (2010). Indigenous use and bio-efficacy of medicinal plants in the Rasuwa District, Central Nepal. *J Ethnobiol Ethnomed.,* 6:1.

Wei, J. (2010). Edible ferns, nuts, and grasses. Downloaded from http://hubpages.com/hub/Edible-Ferns-Nuts and-Grasses on 27/2/ 2012.

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of CMUJS and/or the editor(s). CMUJS and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.